XEROX

Xerox University Microfilms
Ann Arbor, Michigan 48106

WESTERN AMERICANA

Reproduced from the original in the collection of
THE HENRY E. HUNTINGTON LIBRARY AND ART GALLERY

TESTIMONY

TAKEN BY THE

COMMITTEE ON MINING DEBRIS

AS

REPORTED TO THE ASSEMBLY.

TWENTY-SECOND SESSION—1877-78.

TESTIMONY.

SATURDAY, February 2d, 1878.

The Committee met at eleven A. M., in the office of the Board of State Harbor Commissioners. Present—Messrs. Ostrom, Garver, Waters, and Kercheval; absent, J. V. Coffey. J. K. Byrne appeared as attorney for the Hydraulic Association.

The first witness called was A. T. Arrowsmith, who testified as follows:

A. T. ARROWSMITH.

Mr. Ostrom—Mr. Arrowsmith, you are partially acquainted with the object in view of this committee. I will state, this committee was appointed by the Legislature to ascertain views in regard to the washing in our river channels, the filling, if any, in the Harbor of San Francisco, and a general investigation of that subject. I presume that it would be as well for you just to make a statement of your knowledge, and in your own way, as concisely as possible, and then if gentlemen have questions to ask they can do so.

Mr. Arrowsmith—Well, I would merely state that some two years since I had occasion, for a particular purpose, to make some examinations on Bear River and its tributaries, in regard to the amount of mining that was done on that stream. I collected some information at that time which I will give you. In the course of that investigation I visited every mine that was then working on Bear River and its tributaries, and estimated the quantity of earth which was being moved daily, and I started in with the estimate that an inch is estimated to move one hundred and thirty-five cubic feet, or five cubic yards, in twenty-four hours through a sluice having a grade of six inches to the box. But I took, as a basis to work on, the amount of four cubic yards for twenty-four hours. I have found that on Bear River twenty thousand inches of water were used on Bear River and its tributaries during the working season, that is, one hundred and sixty days of twenty hours each, assuming the data as correct that eighty thousand cubic yards move daily, or thirteen million cubic yards per year, during the one hundred and sixty days. I made an examination at Bear River Dam, which is the dam conducting the water from Bear River into the Bear River Ditch, and as near an estimate as I could make from an examination there, and from the ditch tender, I found out that the amount of tailings passing the dam of the Bear River Ditch daily, was twenty-nine thousand cubic yards, or four and a half million cubic yards per annum. Then the amount of debris deposited on the farming lands below Bear River Cañon is estimated at sixty-three and a half million cubic yards, that is to say, itemized, ten thousand acres covered three feet in depth; to which is to be added the fall of the original channel of the river, from the cañon to Feather River, twenty miles in length, two hundred feet in width, and twenty feet in depth. This amount would find its way to the valley in about thirteen years. The quantity of debris remaining in the channel of the river and its tributaries yearly, would be eight and a half cubic yards, which would be an amount sufficient to raise its bed four and a half feet each year, three hundred feet wide, and thirty miles in length. Of my estimate of the materials, about one-third of the wash is sand and gravel—about one-third of the whole. And this, with what are called the "slickens"—sand, gravel, and slickens—are the only materials that have been deposited in the valley below the mouth of the cañon. It was estimated that the quantity of land still liable to be covered at the mouth of Bear River was thirty thousand acres.

Mr. Waters—Is that amount so situated that the same cause would create a like effect as it has on the other?

Answer—Yes, sir. I would state in connection with this that the farmers on Bear River, and on those valley lands, have been obliged to raise levees for the purpose of protecting themselves against the encroachments of the debris, but every season those levees broke, and more or less land continues to be covered over. At least fifty thousand acres are liable to be injured by this debris. The estimate of the number of acres I estimate from information that I have obtained on the ground; I know nothing about it from my own observation there.

Mr. Waters—Would any reasonable system of levees prevent this permanently, or would it only be a temporary prevention, if the same cause keeps on to produce the same effects?

A.—An idea was suggested for the construction of a canal from the mouth of Bear River Cañon down to the tules, and to have all this debris carried down to the tules and cover them up; but it struck me at the time when the proposition was made that no canal of a sufficient grade could be obtained on those level lands there, and with the quantity of water that would keep the material moving; and if that should not be the case, why the canal, like the channel of the river, would fill up just in the same way; so I didn't think that at all practical. The only remedy that suggests itself in my mind was for either the miners, who were engaged in those portions on Bear River and its tributaries, to bind together and purchase all the lands subject to overflow, or have the State or some other party extinguish those titles.

Mr. Ostrom—Did you notice in regard to the channel of Bear River; did you notice the old channel?

A.—I crossed that old channel in eighteen hundred and fifty-one. I recollect where the old channel was—at Johnson's Crossing.

Q.—Did you notice any changes?

A.—Oh, yes! Entirely filled up. You could not tell where the channel was.

Q.—It was entirely filled up?

A.—Entirely filled up.

Q.—What was the original channel?

A.—Well, the original channel, as I recollect it at that early day, the river had come down through those valley lands, and there was a gulch there that was, perhaps, one hundred and fifty to two hundred feet in width, from surface to surface, and from fifteen to twenty feet in depth. I recollect we had to go to the bed of the stream, and then up again on the opposite side. Now, it is entirely obliterated. There is probably no channel of Bear River now; the water just spreads itself.

Q.—You did not prospect to see how deep that debris was over that bottom land?

A.—Oh, no! It was impossible. Represented to me from one to fifteen feet in depth.

Mr. Waters—Could you tell by any trees, fruits—trees seen—how deep the debris was?

A.—No; I could not tell. I cannot form any idea. I know it could not be less, on the average, than three feet.

Mr. Ostrom—You are acquainted with the channel of the Sacramento River—familiar with it?

A.—No, not familiar, no sir—from no examinations that I have ever made. In fact, I will say that I know very little about it.

Q.—You know nothing in regard to the harbor?

A.—No, sir.

Q.—Did you state what object you had in going up and making those investigations?

A.—I merely mentioned the fact that I had gone there to make examinations. I have no objections in stating the object, if you desire it. I went up there in the interests of the farmers living at the mouth of Bear River.

Mr. Waters—While you were making that investigation at the instance of the farmers, did you confine your inquiries to the farmers, or did you also make inquiries of persons interested on the other side of the matter?

A.—Well, I went up there to gather information in regard simply to the quantity of material and the mines that were at work, and also to get the names of the parties.

Mr. Garber—Is this land that is covered entirely ruined?

A.—Oh, yes! Entirely ruined. There is nothing on all the portion that I saw—nothing but a growth of willows. Nothing but moisture—no soil. Simply a gravel and sand bank.

Mr. Ostrom—I would like to ask you, Mr. Arrowsmith, if you obtained your information in regard to the quantity of earth washed from the miners themselves?

A.—No, sir. I made inquiries, of course, of the miners, but I made my own estimate as to the quantity washed. Of course it was a mere approximate; I could not arrive at any conclusion. These facts, I think, that I have stated, are tolerably reliable.

Q.—You gathered them from information you got from the miners themselves?

A.—Yes, and from measurements that I made.

Mr. Byrne—How did you ascertain—from what source of information did you ascertain—the quantity of debris that was passing the Bear River Ditch?

A.—I stated, at the time, that the tender at the ditch informed me that he was obliged to sluice out, twice every day, a length of ditch twelve hundred feet in length, and six feet wide, and five feet in depth; beside which he had a settling reservoir, which he sluiced out once a week, and that was two hundred feet square and some twenty feet deep. Then the gate in the blockade was continued in the opening when there was plenty of water; then the water was running over the dam continually. Of course I could get the quantity very well from the depth and the settling of the reservoir.

Q.—How much time did you devote to that investigation?

A.—I think about ten days.

Q.—You went there at the request of the farmers owning land on Bear River?

A.—Yes, sir.

Q.—This estimate was immediately preceding the institution of the suit now pending, in which Mr. Keyes is interested?

A.—Yes, sir.

The next witness was

CAPTAIN WILLIAM CORLETT.

Mr. Ostrom—Captain, we are here, as a committee from the Legislature, trying to gather facts in regard to the filling of the Sacramento River, or others, if any, and the filling of the harbor, or any portion thereof, if any. Any facts that you know, or any statement you can make in regard to this matter you will proceed to make in your own way and manner, as briefly as possible.

Capt. Corlett—The Sacramento River has filled up. When I first went up the river there was from the slough up—well, take from the lower end of the slough, there was from twelve feet to five fathoms of water in the river, and I have seen that a boat that would run in three feet of water could not get up. From the upper land then there was seven feet of water at low water, and now we have not got over five.

Q.—How long have you been on the river, Captain?

A.—I have been on the Sacramento since August, eighteen hundred and forty-nine, up to last July. Since that I have been on the Vallejo route.

Q.—About what time did the river commence shoaling?

A.—It commenced shoaling in eighteen hundred and fifty-three—that is, sir, if you noticed it. It commenced shoaling gradually in eighteen hundred and fifty-three, and in eighteen hundred and fifty-eight we had to keep the channel. I think it was in eighteen hundred and sixty-three, when, in going to Sacramento, the *Chrysopolis* couldn't get any further up than the R Street levee.

Q.—Well, how was the general tendency of the filling—was it more rapidly of late years?

A.—It has been of late years, yes, sir; and every heavy winter it would fill more. Probably it won't fill so much next summer, because there was no sediment coming down. There was no sediment last year—no washing last year; very likely we won't get as much filling in the river this year. When we have a good summer in the mines—these hydraulic mines—then a great deal of sediment comes down.

Q.—Do you know anything in relation to the filling of the bay or any portion of it?

A.—San Pablo Bay—Suisun Bay fills more or less. It is filling a great deal, from Collinsville near Benicia. There is a bar made in Suisun that is now quite an island; for the first fifteen or sixteen years you could not tell there was a bar there by shoal water; there never was less than four feet of water around there; now at low water it is quite an island. The channels are getting narrower in the bay.

Q.—Do you think that this filling endangers the Harbor of San Francisco, or do you think it ultimately will be dangerous to it?

A.—Well, ultimately will injure our bar outside; but the Harbor of San Francisco, there is a tendency. Whether yet, a person could hardly tell. We have from ten to twelve fathom of water here in the harbor now. The only way I can tell anything about that is when there is no hold in the ground—ships drag their anchors, and sediments settling in the harbor make a very poor hold in the ground. I think it will eventually injure the harbor.

Mr. Garver—Now, according to your judgment of it, you state that Suisun Bay is filling very rapidly—a great deal?

A.—Yes, sir. It is assuming the form of channels. Forming islands; that of course creates channels.

Q.—Now, what will be the effect, when Suisun Bay is filled, on San Pablo Bay?

A.—Well, it will naturally fill portions of it.

Q.—You think, then, that it will have the same effect that it is now having on Suisun?

A.—It will have the same effect in time. That is, it will within the range of Palmetto Point and the Brothers, and Palmetto Point and the Straits.

Mr. Kercheval—Of course we are not looking to the next year, or twenty or fifty years; we are looking to what the final result will be if hydraulic mining is carried on for the next fifty or one hundred years, and increases as it has now—what the effect will eventually be on the Harbor of San Francisco?

A.—Well, it will have the effect of shoaling it up, and shoal up San Pablo Bay, too. It will take time, of course. Of course they won't do it as rapidly as Suisun Bay.

Mr. Kercheval—We are not making this inquiry for a year or two, but for the great future.

Mr. Waters—What average relation does the water have at the present day to that in eighteen hundred and forty-nine and fifty—take it from the mouth of Steamboat Slough above Rio Vista, on the Sacramento; what average relation of depth?

A.—Well, to average that, for instance, there are some portions that had four and five fathom in it. Now, at the Hickox, we don't have over ten feet at any time; and down below—well, from Freeport down, we had from four to five fathom until we got to the slough, and all from the slough five fathom; now in the summer time we have hardly got over five or six feet in some portions of it.

Mr. Ostrom—I presume you recollect in forty-nine to sixty-six and sixty-seven, there used to be strong opposition. At those times, I presume you recollect, vessels would run side by side right in with the greatest velocity, with just as much steam as they could carry. Well, what is the difference now?

A.—Places where steamboats ran at that time are dry now.

Q.—Could not run side by side?

A.—No, not anywhere.

Q.—Have to confine themselves exclusively to the channel?

A.—Yes; and close as they can into the bay.

Q.—Well, does that filling seem to be general in the various channels that you are acquainted with?

A.—Yes.

Q.—You are acquainted with the old river?

A.—Well, not much acquainted with the old river. I have run the old river—not for years.

Q.—They did occasionally run it in eighteen hundred and forty-nine and eighteen hundred and fifty with steamers?

A.—Yes, at that time. I have not run it much. Couldn't say much about it. I haven't been down over it for years.

Q.—In regard to this filling, Captain—does it fill from the mines, do you think?

A.—Yes, sir; all fills from the mines.

Q.—There is one question—I presume we may ask the Captain that question, but I want to state it to the committee—it is rather a peculiar one. Now, it appears singular, and many persons have asked me, and I have heard it discussed frequently, why there is so much less water within the channels now at low water than there was formerly, even admitting that the channels are filling in the same tendency. I would like to ask you, Captain, what is your idea in regard to that?

A.—Well, that is a simple question, in my mind. If you have got three fathoms of water here, and you have not got but ten feet up here, this fills up to ten feet and then remains ten feet. There you have ten feet, long before you had three fathom, and now you have not got but ten feet (illustrates). It will make a regular grade.

Mr. Waters—You state you have been on the river since eighteen hundred and forty-nine?

A.—Yes, sir.

Q.—Have you noticed the difference in the quantity of land overflowed by freshets since this filling of the bed of the river—as to whether more land is overflowed now by water than was in early days, during the same stage of weather, for instance?

A.—Well, no; I could not answer that question, on account of levees keeping the water out. The lands are all leveed in now, and keeps the water out; but I have seen the lands covered from as far as I could see on both sides.

Q.—Before they leveed?

A.—Yes, sir.

Q.—Before the bed of the stream was raised by this debris?

A.—Before the bed and after the bed; when the levees broke away and filled the land full.

Mr. Garver—In eighteen hundred and sixty-two, therefore, when the flood was, it would have been almost impossible to keep the water in?

A.—You could not possibly keep it in.

Q.—It was almost continuous?

A.—Yes, sir.

Q.—And steamers and boats went over the valley?

A.—Yes, went over the valley, overland.

Q.—I want to know whether this land was filled from debris or from natural causes?

A.—I have seen the whole land overflowed in eighteen hundred and forty-nine—overflowed on both sides, before there was any debris or before there was any levee.

Q.—Is the bed of the river lessened to the same extent that it is filled in—just leaving all elevation out of view entirely—is not the bed of the stream lessened to the same extent that it is filled up?

A.—Lessened in width?

Q.—No, sir; lessened in capacity?

A.—Oh, yes; lessened in its capacity to carry.

Q.—Now, about how many feet in height or depth is it lessened on an average?

A.—Well, at Hickox Shoals, say, it is shallow water, because it is a long reach and the water spreads all over and filling the bed of the river. Even where the narrows was, always had there plenty of water right straight across; but on the Hickox Shoals it was generally the same depth almost clear across. Take it on an average with that—well, you could not average with that, because, above and below we had any quantity of water. Well, the water had to pass from this highest place——

Mr. Garver—Well, he wants to find out how much less capacity the river has?

A.—Well, another place would tell the capacity of the river—deeper places you would not need now. Well, these narrow places have filled up entirely—just room enough for a smack to go down.

Mr. Garver—Well, I will ask you one question—say right there at Sacramento, right opposite the cars, how much would you estimate the depth of debris there?

A.—I should estimate it at about eighteen feet.

Q.—Gravel and sand?

A.—Gravel and sand.

Q.—Is that a fair average of the stream—at that point, is that a pretty fair average?

A.—That is a pretty fair average.

Q.—Do you think, Captain, the river has filled eighteen feet on an average from its natural banks?

A.—Yes, sir.

Mr. Ostrom—At most all portions of the river it has filled up more or less, on one side or the other; is it less now on an average—the carrying capacity less now, on an average—from the Sacramento side to the mouth of Steamboat Slough, for instance—say lower even, we will take the whole river as you used to run it and on average, counting the sudden filling and the bottom filling, all—how much do you think the average capacity would be—less than what it was when you first knew it?

A.—Well, I don't know how to answer that question. For instance, here is a reach here, and carries a small stream down here (showing), and this side the reach is clear, dry land. Now, here we have got a small space down here, probably one hundred feet wide, which before we had five hundred feet in width; it is filled up about four hundred feet, and made an island of it. Now, there are many places on the river filled up, and been made an island, that used to be deep water. Yes, deep—seven and eight feet.

Q.—Well, include all those places in your mind, as near as you can, and make an average of the filling within the old channel, as you first knew it. Make an average of the carrying capacity of the river.

A.—Well, I should think one-half of the capacity is gone.

Mr. Garver—That is from inside of her banks?

A.—From inside of her banks.

Mr. Waters—Are you familiar with the river above Sacramento?

A.—No, sir. I never went up there more than once.

Mr. Corlett's testimony having ended, the committee took a recess to half-past one o'clock.

AFTERNOON SESSION.

The committee—Mr. Coffey absent—resumed their duties at one o'clock and thirty minutes P. M., and called as the next witness

T. T. ALLARDT.

Mr. Ostrom—I presume you are acquainted with the objects of this committee. We are here endeavoring to ascertain simply the facts as they exist in relation to the navigation of the rivers, the Sacramento particularly, and the Harbor of San Francisco, or any portion of it, and your opinion in regard to the cause of the same, and what, perhaps, would be a remedy. Now, you can, in your own way, just proceed and make any statement you see fit.

Mr. Allardt—This is a subject where there is a lack of data to give any definite figures, in a great many respects. I will confine my remarks more especially upon the effects to the Harbor of San Francisco—the effects of the debris, of the tailings, upon the Harbor of San Francisco. And there I will take the statement of other parties, as I have made no personal examination. The debris coming down the rivers is carried down the Sacramento River and its tributaries, passes Sacramento City, and finally reaches Suisun Bay. A large portion of that settles in Suisun Bay. The latter portion goes to San Pablo Bay, the still latter portion to San Francisco Bay, and out to the Heads. Mr. Arnold, the engineer of this Board, wrote an article on this subject, and he makes this statement. He starts in with the statement that Doctor Logan, in a paper read before the Scientific Institute in September eighteen hundred and seventy-three, says: "The solid matter carried in suspension past Sacramento City is sufficient to cover in a year a square mile to the depth of two hundred and six and one-half feet." On this basis Mr. Arnold makes some figures, and in his article, which appeared in the Overland Monthly in eighteen hundred and seventy-three, he says this: "If, therefore, the sedimentary matter were all deposited in San Francisco Bay, the bay would be filled up to the line of high water in fifteen and one-third years." This being written five years ago, that would be ten years hence, and San Pablo Bay would be filled up to the same level in thirteen and one-quarter. Now, when Suisun and San Pablo Bay have become filled, when these last basins have become filled up, the next basin will be San Francisco Bay. This will be filled up in course of time, it being larger and deeper of course it will take further time, on that hypothesis. But these are only theories.

It occurred to me that to arrive at something more definite, this thing would have to be done. In eighteen hundred and fifty-six, the United States Coast Survey made a survey of San Pablo Bay, an accurate survey and soundings, and in ten years later they made a survey of Suisun Bay—in eighteen hundred and sixty-six. This hydraulic mining commenced, I think, about in eighteen hundred and fifty-six or fifty-eight. Now, if the Government, or if a resurvey could be made of those two basins—Suisun and San Pablo—be made by the same authorities, by the Coast Survey, taking the same base, and compared with the surveys of sixty-six and fifty-six, probably, a good deal of knowledge would be derived as to how much had been filled up—how much had been filled up from artificial causes. There is a survey—I have seen it—a survey of these bays that was made in eighteen hundred and forty-one—it might be best to compare the survey of eighteen hundred and forty-one with eighteen hundred and fifty-six, when hydraulic mining commenced.

Mr. Smith—Allow me, in eighteen hundred and fifty-one.

Mr. Allardt—Well, I only throw out these suggestions. While if a resurvey could be had, and comparisons made, perhaps something very definite might be arrived at. I suppose it will be found that these bays have become very shallow. As to the general question of debris, it only occurs to me to say, that perhaps before any intelligent action of the Legislature could be had on it, it might be necessary to ascertain perhaps these points: First, the amount of material that has been removed by artificial means from the mountains from the time of hydraulic mining, which probably might be arrived at by measuring the excavations; second, how much of that material is deposited in the streams themselves; then how much of that had covered the valley lands, the farming lands, and finally, how much was carried away into the Sacramento River and into the harbor. That would be a labor of considerable magnitude probably.

Mr. Ostrom—I believe you was connected with Mr. Irwin in his survey of the bay here?

A.—Not connected with him officially, but he and I have consulted and talked together a great deal on subjects connected with the harbor and islands here. I was the engineer for the Tide Land Commissioners here some years ago.

Q.—What do you think of this phase of the question? We will say, for instance, that this year it would leave a deposit of six inches; next year it would be an additional fill, would it not, on that?

A.—In the bay, do you speak of?

Q.—In the bay, or anywhere—wherever this sediment settles? Next year, perhaps, it would fill eight or nine inches?

A.—Yes, sir. I should say the tendency would be the rate of filling would increase, as the scouring and action of the tide become less. For instance, San Pablo Bay would finally become a river going through low lands—assuming this theory to be correct. Of course the whole theory then is based upon the statement of Doctor Logan, which I don't know is correct or not.

Q.—Are you familiar with the Sacramento River?

A.—I have seen it frequently.

Q.—Know anything about its filling?

A.—No. I cannot state as to any changes at the bottom, from my own knowledge.

Mr. Byrne—Have you ever made any calculation to enable you to determine how much of this sedimentary deposit comes from hydraulic mines, and how much from the natural washing of the country; that is to say, from agricultural lands which have been plowed up, or hillsides which have been cultivated, and the earth washed from them into the ravines, and thence into the rivers?

A.—No, sir. I have no figures on that at all.

Mr. Garver—How much of this bay is filled by the dumping in here from the city? Wouldn't that spread over the bay considerably? What they keep dumping here, and it naturally being soft stuff, would flow out and get into the bay?

A.—There is undoubtedly considerable material goes from the street—the sewers don't amount to anything. But I suppose the most of the serious filling in is derived from dredging—dredging the slips and carrying it out into the middle of the bay, and then dumping it. What is dredged out here is taken out into deep water, a mile or so, and dumped into eight or tens fathoms water. It is more the pushing out the city front—that is, what I mean, the pushing out is doing more harm. For instance, Mission Bay, where the railroad company made embankments; they have narrowed the water on each side—made stone embankments.

Q.—Isn't that dredging injuring the bay more than the debris?

A.—No, I should say not. I should say that it was a small amount. It looks to be a good deal, but is really a small amount when you come to cubic yards coming down from the mountains. I would not be prepared to say what proportion it might be.

Q.—Was you ever on the Mississippi River?

A.—Only as a traveler.

Q.—I was going to ask if you had any idea what the comparison would be between the debris coming down this river and the sand there?

A.—It was pretty muddy there, but no comparison to the Sacramento in mud.

Mr. Byrne—I understand that you were the Surveyor of the Board of Tide Land Commissioners; as such you had occasion to examine the bays and all portions of the harbor here?

A.—Yes, sir.

Q.—From your own knowledge and observation, has there been any shoaling or diminution of depth of water in those bays from sedimentary deposit, since you have known them first?

A.—Yes, I recollect making some comparisons with the Coast Survey soundings over at Point Oakland, and also in Richardson's Bay; and I recollect this, that it became somewhat more narrow since that time—perhaps half a foot.

Q.—On the Oakland shore, and in Richardson's Bay, which is on the Marin shore?

A.—Yes, sir.

Q.—Did you observe any shoal water at any other points or places?

A.—No, not that I could make any statement about.

Q.—What effect, in your opinion, will the reclamation of the large bodies of land, say at Sherman Island and other places upon the Sacramento, have upon this question, so far as the tidal area is concerned, and diminishing the effect of currents?

A.—You speak particularly of currents in the bay or in the rivers?

Q.—Yes, sir; I speak of them in the bay, so far as they have a tendency to remove any little sedimentary deposits that may come from the mountains, especially as to the entrance at the bay, the outlet of the harbor?

A.—The reclamation of the tule lands, if it was thorough and general, would result in confining the streams to their channels, and not spreading, as in the case of floods—not spreading over the whole country. The natural result of course would be that the velocity in the currents would be increased—the velocity in the motion of the rivers would be increased; in flood times the velocity would be increased. It would carry fewer material and carry it further—sedimentary material—down towards the bay. The result would be it would increase the sediment, provided the stuff from hydraulic mines was collected; it would rather increase the sedimentary deposit in those bays—Suisun Bay.

Q.—What effect would that probably have upon the bar itself, or the entrance to the harbor?

A.—That is a difficult question to answer. I would not like to venture an opinion upon it. There are different views taken on that subject, as to what forms the bar.

Q.—What effect do you think the filling in, say of Mission Bay, and the filling in of this portion of the city below the original water line here, and other places that have been filled in in this city—what effect has that upon this question? That is to say, the shoaling of the bay, and particularly the shoaling of the bar?

A.—Mission Bay and the greater part of this water front, that is, the tide lands upon which the city has been now extended, I take it is naturally shoaling all the time, and would eventually become dry land; and making it a city and laying it out in blocks merely hastens that.

Q.—Don't you think that the removing of sand from the lots and depositing it in the bay has a serious effect upon the shoaling of the harbor?

A.—Oh, yes! yes, sir! There ought to be provision made to prevent that.

Q.—Don't you think that is much more serious and dangerous than any debris that may come from the hydraulic mines in the mountains? In other words, hasn't it a more direct and injurious effect upon the harbor?

A.—It has a great direct effect, but I should certainly say that the point in comparison is very small as compared with that coming down from the mountains. It hardly makes the water turbid around here, while the debris from the mountains, either from artificial or natural causes, discolors the water in one river and the two bays and San Francisco Bay, so it must be very extensive.

Q.—Did you ever make any estimate as to what proportion of the material washed from the hydraulic mines in the mountains reaches San Francisco?

A.—No, sir.

Q.—Do you know what proportion of that material which is washed out from the hydraulic mines is light, and what is heavy and incapable of being removed such a distance by the action of water?

A.—I can't say much about hydraulic mines. I do not consider myself at all acquainted with hydraulic mining business.

Mr. Byrne—That is all, sir.

Mr. Waters—Just one question. You say it is clear, the water of the bay?

A.—Yes, sir.

Q.—Did you see any perceptible difference in the extent to which it colors the water of the bay in one part as distinguished from another? That is, does it make it muddier in one particular locality than elsewhere, or does it generally diffuse this color all over the bay? That is, does it look muddier at San Pablo Bay than it does at Oakland?

A.—Yes, sir; when you come to compare bays, it looks muddier at Suisun Bay than when you come further down. At San Francisco Bay the whole bay is sedimentary; the turbid, discolored streaks striking off where the currents run.

Mr. Ostrom—In crossing the bay to Vallejo, have you ever noticed when you get out some three or four miles you there see and begin to come into the muddy water? Did you ever notice that, over on this Vallejo route, in crossing on the steamer.

A.—In going to Vallejo, well then, we go to Red Rocks, in that direction?

Q.—Yes, sir?

A.—I cannot speak with definiteness on that matter.

Mr. Garver—I want to ask you this question: How does the debris get on this side? When the tide goes up it keeps the slack water up the river, the river water back, and when they empty, as I understand it, they both empty at once. How does the debris get over to San Francisco?

A.—There is a current from Red Rock, and it goes over on to the Oakland side. I don't know whether it is carried over to San Francisco.

Q.—I speak generally, as coming into San Francisco Bay. How does the debris get up over this side, when the debris that is running out first follows the tide, goes out, and keeps debris back; when she empties she all empties at once; then how does the debris get over here?

A.—The debris would settle where the tide meets the current, wherever that is.

Q.—Yes, that would be way up above. As far as my experience in steamboating goes that depends on how high the river is. The question is, how does the debris get over on this side—how the debris gets over here?

A.—I stated I have not studied the subject, and have no doubt others can answer it more satisfactorily than myself.

Mr. Ostrom—I have said that at sometimes a strong current sets around on that side of the bay?

Witness—On the Oakland side?

Mr. Ostrom—Yes, sir.

Witness—That is a fact. There is a strong current across from Oakland wharf, both ebb and flow.

Mr. Kercheval—The first meeting of the tide is at the Heads. The flood meets the ebb tide at the bar, at the Golden Gate, and it begins to back it up and back it up until it gets to the lighthouse. Wouldn't all the flood-water coming from the mountains down, wouldn't it be thrown back and diffused in San Francisco Bay until the tide is entirely checked, so that it begins to set it back in San Pablo. All the muddy water coming down to the narrows, there at the lighthouse, until the tide checks it, naturally would be diffused through the waters of San Francisco Bay, then up to the Straits of Benicia—all the muddy waters, until the tide checks that downward current, would be diffused through the waters of that bay, and so on?

Witness—It seems so to me.

Mr. Kercheval—And then, of course, when the current sets in to the ocean again, that is to say, the ebb tide sets in full, of course they all commence draining down. I should judge that all those waters being diffused—the muddy water being diffused—the muddy water settles during the time the flood-tide is running in, and of course goes on settling right in the wharf here.

COLONEL MENDELL.

Mr. Ostrom—You are acquainted with the objects of this committee. You can proceed and make a statement in your own way.

Colonel Mendell—Well, sir, I have not got very much statement to make. I am very willing to answer any questions, as far as I am able to answer them that may be asked me. I say, previous, I have not a very great acquaintance with the subject, though I am brought somewhat in connection with it by having charge of the improvement of the Sacramento and Feather Rivers, and also the construction of the Oakland Harbor has made me somewhat acquainted with the general condition of the harbor, and it is a very big and complicated subject. I have not formed opinions about it, but am very willing to answer any questions.

Mr. Ostrom—How long have you been acquainted with the harbor?

A.—Oh, for a good many years; for the last ten or eleven years. I was formerly in California in eighteen hundred and fifty-four; I was here then four or five years, but my acquaintance with the harbor is more within the last ten or eleven years.

Q.—During that time, have you noticed any marked change; any shoaling of any portion of the harbor?

A.—No, sir; the only way we could arrive at any such change is by sounding, by careful survey; and with regard to that matter, the way to ascertain that would be to compare the surveys that have been made at different years.

Q.—Well, I didn't know but what you had made some observations?

A.—No, sir.

Q.—You have been connected with the improvement of the channel of the Sacramento and Feather Rivers?

A.—Yes, sir; the government made a little appropriation two or three years ago, and I expended that on those two rivers. In that way my attention was directed to them more than otherwise.

Q.—You were not acquainted with them before they filled up?

A.—No, sir. Of course I have been a traveler on them many times. I have never formed any opinion in regard to the former times other than any traveler would.

Q.—Well, I suppose you have a theory in regard to some remedy for this shoaling of the rivers? You have been employed in cleaning out obstructions?

A.—Yes, sir.

Q.—Sand banks and sand bars.

A.—Yes, sir.

Q.—Well, the committee would like to hear your opinion on that?

A.—Well, with regard to a sand bar, we usually get rid of that by local treatment. We wash out the material there ordinarily, if it is not dredged; in which case, if it is dredged, and the same cause that produces the bar should be likely to produce a second, then we dispose of it by treatment of the river—by building winged dams; besides, by the action of the current, we wash this material out. When it is gone from that place it goes somewhere else, and that accumulates in some other place, and then we have to go and try it in the same way. That is, substantially, the course.

Q.—The effect of that is constantly to bring it this way.

A.—Oh, of course. All natural causes, and artificial ones too, are working to bring the mountains down to the level of the sea. The frosts and the floods, and the ordinary action of a stream when not in flood, are all in that tendency. You can see the results of that on the charts of the harbor if you will go back in imagination to the time when the whole of these tide lands that now border the bay that extend now to the level of ordinary high water; there was a time when these lots were under water, and the streams and the action of natural causes have raised these up to the condition in which they are now; and the same operation is going on all the time. The action of natural causes is to destroy our harbors, not only here but everywhere.

Mr. Waters—You say that even from natural causes the universal tendency is to wash the lands to the sea; now if that is the natural tendency, say you assist nature by means of these hydraulic mines, it increases it just that much.

A.—It undoubtedly has some increase.

Q.—Then that debris that is washed out of the mines, it goes in the same channel, and is distributed by the same natural causes?

A.—Yes, it goes somewhere; I don't pretend to say where it goes.

Q.—Then you can go to a hill and measure a section that is piped out, and you can calculate that many square yards is carried off further, carried down below, and helping to raise the bed of some stream?

A.—Carried somewhere. But the part of it that was heavy—for instance, in hydraulic mining, large stones have passed down from these steep flumes under the action of that strong current, but they don't go very far. I presume, if you took the surveys and compared them, the whole thing would be laid before your eyes.

Mr. Ostrom—I would like to ask you, Colonel—you are familiar with the channel of Feather River—I believe that was three years ago that you worked on Feather River?

A.—Yes, sir.

Q.—How much depth of channel did you have there?

A.—When we commenced?

Q.—Yes, on an average, as you kept it?

A.—Well, most all these rivers consist of pools; as my observation has been, most of these rivers consist of pools. That is, there is a stretch of more or less length—several miles, may be less—where the water is found deep; then you come to a little bar on which there is a more rapid current and which has shallow water. Now, on those bars in Feather River there was about twenty or twenty-two inches—something like that. We found there that when we got the river down to the low water, six hundred feet in width, that we could make a fair channel for the little boats that run there; and where the river spreads out and got twelve hundred feet in width.

Q.—How did you obtain this depth of water?

A.—We run out little brush dams from the shore. Very light material at the bottom, and the least little material would start it out.

Mr. Kercheval—This year the Sacramento River is little over twenty-three feet above low water mark; can you give us any idea of the amount of matter that would pass in any given time?

A.—I don't know anything about it. The only way would be for a man to take a good deal of pains to ascertain it. I have not had occasion to do it.

Mr. Byrne—How long is it since you have first known the condition of the bar here?

A.—I have been acquainted with it from the chart—well, always more or less since I knew anything.

Q.—When was the first survey made?

A.—The first survey I have any knowledge of was made by the exploring expedition directed by Captain Wilkes, long before the Americans occupied the country, in eighteen hundred and forty-one. I have Captain Wilkes' chart there in this bundle; it does not go into much details with regard to the bar.

Q.—Well, what difference, if any, was there in regard to the depth of water on the bar then and now?

A.—Well, this survey that I have of Captain Wilkes is hardly in detail enough. There were only three or four soundings taken. There was a survey of the bar made in eighteen hundred and fifty, early in fifty, I don't know exactly when, and another one made in eighteen hundred and seventy-three; those two surveys are applicable for comparison.

Q.—Was there any survey made between those dates?

A.—No, sir; not to my knowledge.

Q.—Have you compared those surveys?

A.—I have compared those charts to keep the run of it—the one in eighteen hundred and fifty and the one in eighteen hundred and seventy-three, all the surveys by the Coast Survey—I am not sure with regard to the dates. I think one was in eighteen hundred and fifty-five and the other in eighteen hundred and seventy-three.

Q.—What difference was shown by those surveys with regard to the depth of water on the bar?

A.—Well, it is proper to state with regard to them, that in order to get an accurate comparison, the plane to which the soundings are reduced must be precisely the same. The plane of mean low water to which the Coast Survey reduced their soundings, is not well established. In eighteen hundred and fifty-five, when the first survey was made, I am inclined to think that survey was not well established; and if their sounding was not reduced to the same plane as the one made in eighteen hundred and seventy-three, then you could not have a fair comparison for details, although good generally. The comparison that I have made of those two surveys shows more water in eighteen hundred and seventy-three than in eighteen hundred and fifty-five. I have made a number of profiles from them; I have got them in that bundle (referring to bundle on the table). Though those profiles indicate more it would not be fair to say that there is more, but I think that there has been no essential diminution at least. (Witness produces profiles.) As a general rule they indicate more water than before. The blank line indicates the section (section A. B.) of the bar as it was in eighteen hundred and fifty-five. I would not say that there is more water than before; but I think this conclusion is perfectly fair, that there is no less. With this marginal explanation the diagram can be understood by the committee, particularly if they have a chart of the harbor with them.

Mr. Ostrom—I would like to ask you one question: Did you draw those plans from actual observations and soundings?

A.—Took the Coast Survey charts; from other charts. I got access to the tracings of the original surveys made in eighteen hundred and fifty-five and eighteen hundred and seventy-three, and I took those surveys.

Mr. Byrne—Does the survey of eighteen hundred and forty-one, to which you refer, give any data by which you can determine or ascertain the depth of water then to the publication of the last survey?

A.—The same difficulty is there as I spoke of before; we don't know exactly what plane his soundings were reduced to, and there are very few of them here (on eighteen hundred and forty-one chart). There he shows six fathoms across the bar. He does not show any less sounding than six fathoms across the bar, except there (pointing) which is probably across the four-fathom bank. Now the soundings here (on other map) show five and one-fourth, five and one-half. Of course, if we knew exactly that Captain Wilkes' plane was the same as the Coast Survey, why then we would have this comparison.

Mr. Ostrom—I would like to ask you, Colonel, and in explanation I would say that two years ago I was on the Committee on Commerce and Navigation, and there were some gentlemen that were pilots that were up there. One of them testified that the bar outside the Heads had shoaled in one particular passage within his knowledge; probably at an earlier date was sufficient to carry large vessels, that now was only sufficient to carry a fishing smack over it at high tide?

A.—I don't know; all my knowledge is confined to those public records, which, I presume, are worthy of all confidence.

Mr. Waters—You say some pilot testified to that?

Mr. Ostrom—Yes; there was some such testimony of that kind.

Mr. Ostrom (to witness)—I would ask you if you have any personal knowledge in regard to the shifting of the bar? Does it shift?

A.—I presume it does, more or less. Some days, may be, with a big storm. I know this is common on bays, although I have no personal knowledge of this.

Mr. Byrne—Colonel, what difference, if any, is there in the depth of water between the city front here and Oakland?

A.—(Looking on chart)—Well, running from Market street to the middle of Goat Island, the first sounding seven fathoms—twelve—twelve and a half; close into Goat Island, twenty-four. That is the Coast Survey chart, survey of eighteen hundred and fifty-five. (Reading from chart.) This is Wilkes' chart of eighteen hundred and forty-one. He has got nine, ten, fourteen fathoms.

Q.—What would you say the difference is, if any?

A.—Well, I would not say anything about it.

Q.—That is to say, that there is no difference?

A.—No; I don't know anything about it. I don't consider this sufficient to form an opinion on.

Q.—Well, could you tell by a comparison of the charts of fifty-five and seventy-three?

A.—Yes.

Q.—Well, do that, if you please.

A.—I have not got the chart of eighteen hundred and seventy-three. I don't think it has been published; it is in manuscript.

Mr. Ostrom—I understand this last chart was drawn in eighteen hundred and fifty-five?

A.—In eighteen hundred and seventy-three.

Q.—The last you exhibited here?

A.—No; not exhibited here.

Mr. Ostrom—Well, there was none of this hydraulic washing here at that time. What are the usual causes to increase the depth of the bar, and to diminish it?

A.—The battle ground between the sea on the one side and the tidal currents on the other. And the depth of water is the compromise between the two; and if you increase one of those forces, you but diminish the other. You will notice this effect on the bar. If you diminish the quantity of tidal water that comes and ebbs over that bar, you lessen then the resistance which it then makes to the action of the sea, which tends to pile it up.

Q.—What effect does the reclamation of these lands, at the mouth of the Sacramento River and in the neighborhood of Sherman Island—what effect does the building of these levees and the extension of the tidal waters over these lands have upon the proposition of the increase of sediment on the bar?

A.—According to the view that I have expressed, the depth of water results from the quantity of tidal water that goes in and out. Some levees are directed towards shoaling the bar, or any cause, whatever it may be, which diminishes the tidal flood in here and the area covered.

Q.—If there is a settlement of this sediment in the bay—we may suppose that Suisun Bay was entirely filled up, for instance—now, don't you suppose that would make a material difference, according to your theory, on the bar on the outside, if it were filled up to the level of high water?

A.—Very decidedly; whatever fills it up. I don't care where it is, if you throw a shovel full of ashes here on this beach, between high and low water mark, your efforts are injurious to the depth of water. The shovel full is nothing, but the principle is there.

Q.—Would these reclamations and the filling in of the waters in San Francisco and elsewhere on the margins of the bay—do they not tend to more directly and positively interfere with the depth of water on the harbor than any sediment that might come down the river, carried in the currents of the Sacramento River?

A.—Well, that is a question of degree between these things. Of course I can conceive of reclamation projects there that might cut off more tidal water than the river would probably do in a great many years.

Q.—How many years—fifty?

A.—I don't say.

Q.—We want to get your views?

A.—I give you my views with the utmost frankness. I have not got any positive views at all. I don't know of the facts. As I have no definite opinion on this subject, I don't express any definite opinion. But the tendency is that way, of course. The reclamation that is going on now, more or less, the effect of that is injurious.

Q.—Doesn't the sediment that comes down from the mountain streams, which is deposited below low water mark, does that have any injurious effect upon the bar?

A.—On the channels it has, but not on the quantity of water. If deposited below high water mark it may be injurious to the channels, but not to the bay.

Mr. Waters—Don't this consideration come in? If you bring Suisun Bay—the bottom of Suisun Bay—two feet nearer to the low water mark, will not these natural causes sooner bring it above the low water mark?

A.—No, sir; it don't take so long to fill up two feet as four, but if this thing is kept on long enough that effect will be.

Q.—Although it may now be below low water mark it may eventually be above it?

A.—Yes, sir.

Mr. Byrne—Have you ever studied this question, as to what proportion of this sediment is deposited from the hydraulic mines being worked and how much from agricultural work?

A.—No, sir.

Q.—Have you ever made any estimate which would enable you to determine how much material removed from the hydraulic mines finds its way to the bay?

A.—Pretty hard to find it out. Anybody finding out these questions has got to go to work and spend years on the subject, and spend a deal of money. These questions are plain and simple to ask, and very hard to answer.

Q.—Does it follow that because there is mining at the head of a river, or upon its tributaries, that the water must be muddy; or are there not other rivers in the world well known that carry in suspension a large amount of material?

A.—Yes, sir.

Q.—Will you state some well known?

A.—The Mississippi is the most noted example we have in this country. It is true with rivers that do not flow on a granite or stone foundation; it cuts in its banks, and carries a great quantity of material in suspension.

Q.—Does not the cultivation of the soil and the increase of agricultural pursuits—does not that enlarge this quantity, and cause more material to be carried down by the rivers?

A.—Well, I don't know, sir. I have no knowledge of it myself, nor have I ever studied the subject.

Q.—Do you know about how much land, on the margin of the Bay of San Francisco, has been called tide lands? How many thousand acres, or square miles—put it in that shape?

A.—I did once, I believe, make a rough measurement of the area of the bay, including these lands, but I have forgotten, really, what it was. I think it was about four hundred square miles, but am not quite sure about it. I made a measurement as to the area of San Pablo Bay, and Suisun Bay. I have them. The area of San Pablo Bay is one hundred and sixteen square miles, and Suisun Bay fifty-two square miles. That is the bay. As I don't remember, there is no use in saying anything about it. It is easily ascertained, if you take the trouble to do it.

Q.—I understand you to say that all these tide lands were formed by natural causes—sedimentary matter deposited upon the margin of the bay?

A.—Yes, washed down from the hills; perhaps the river deposited some of it. I suppose at some time it was all water, perhaps deep water.

Q.—Now all these tide lands were before we had hydraulic mining at all?

A.—Yes, sir.

Q.—They antedate that period entirely?

A.—Yes, sir. The whole area, including these tide lands, including the areas af all these bays, was four hundred and fifteen square miles.

Q.—And how much would that leave the tide land area?

A.—One hundred and fifty-eight.

Q.—Well, then, about one hundred and fifty-eight square miles of land surrounding this bay was formed by natural causes before there was any hydraulic mining at all in this country, according to your opinion?

A.—Yes, I suppose so.

Q.—How much land, in your opinion, has been formed since hydraulic mining commenced?

A.—I have no opinion.

Q.—Have you ever considered this question, as to the effect that the quantity of water stored in the mountains by means of the reservoirs and other places would have upon the navigation of these rivers when it is let loose in the summer season?

A.—When we were doing work on the Feather River; I believe it is the habit of some of the mines, at least, to shut off Sunday, and we then, along about ten or eleven, or in the morning, we always had four or five inches more water than Sunday, and then that kept up all the week until they shut up again.

Q.—You gained four or five inches in depth on the channel?

A.—Yes, sir. This was on the Feather River. The storage on the Yuba is something in the neighborhood of five thousand millions. That storage is beneficial in two ways: First, because it will hold back a certain quantity of water when the floods come, as far as the storage goes; of course it is this far a very small percentage, but as far as it goes it is beneficial in that way. It holds back the water in the floods and to that extent keeps the floods down. Then, as that water is let out in the summer, in the four or five months of low water, it helps a little in securing more depth, and is to that extent beneficial.

Mr. Kercheval—When this is let out, in the summer time, won't it bring more deposit to obstruct the streams?

A.—Well, I don't know much about this hydraulic mining. Only traveled through there; saw what I could see in a day or two, in going through the country. As near as I know, the great bulk of material is brought down by the floods. They wash down their material through sloughs which have a fall of three or four hundred feet to the mile, and they carry it down and make a big dump. I saw some rivers that were nearly closed up by that great pile of debris. Then when the flood-water comes, it takes it down to the river.

Mr. Ostrom—You have noticed the waters up these rivers very closely? I will ask you if you ever saw, in any other part of the world, water that held in solution anything like the amount of earthy matter that this has?

A.—I never measured that or any other river in the world. I say I don't know.

Q.—Your opinion, of course?

A.—I have no opinion without facts to base it on.

Mr. Byrne—You know something about the system of reservoirs which is now in course of construction in the mining counties of this State? If so, can you give the committee some idea what effect they will have, when completed, upon the storage of water and the increase of water in the dry season, in the manner you have stated?

A.—My acquaintance with the whole amount of storage is not thorough, and I am hardly qualified to say much about it, any more than to say what I said—that the effect, so far as it goes, is beneficial in two ways—first, in restricting the floods, and second, in affording deep water in the summer.

Mr. Byrne—What method occurs to you of solving this difficulty—of obtaining data, and then devising some means by which both miners and farmers could be protected?

A.—Of course, when you diagnose a case, as the doctors would say, you get it then in an intelligible form; you can tell, then, the extent of your evil, and, perhaps, judge what will serve to remedy it. If the State goes into anything, it seems to me she ought to find out the facts in the matter, and so far as the opinions of people go I would not give a snap of the finger as compared with the few facts that can be got by survey. That is the only way I know of in which the subject can be approached. Now, exactly what the State ought to do, or how she shall do it, I don't know as I am prepared to say; but that is the foundation of the thing, about this and everything else in engineering. It is a general principle in engineering: if you have got all the facts in the case, it is ordinarily, in most cases, a solution quite plain. If a man goes to work to treat a case in ignorance of the essential facts of the matter, the chances are he makes a mistake. He generally does that about nine times out of ten. If any Commission takes hold of this subject and goes to investigate it in all its bearings, they will find it a pretty big subject.

Mr. Byrne—Should not this Commission which you speak of be engineers?

A.—Well, they ought to be people accustomed to deal with this class of subjects.

Q.—Lawyers and merchants would not be competent?

A.—Well, I would not like to generalize. There is a lawyer who might, and a merchant who might.

Q.—Unless a man is an engineer he cannot be able to do it?

A.—All engineers could not do it; but engineers, who, by the run of their duties, have their attention more directed to this thing than lawyers.

Mr. Waters—Some of us have the idea that so far as this affects the bay and the navigable streams it would be a more appropriate subject matter for the United States Coast Survey?

A.—I don't think it would hardly be right for the State to go to that expense for surveying the San Francisco Harbor. That part ought to be under the supervision of the United States. I dare say something might be done by the General Government in this way. If it were thought necessary to make a survey of Suisun and San Pablo Bays, in order to make comparative surveys, to establish what changes have taken place since the last survey, the Coast Survey would be the most natural people to do it; and very possibly—of course I don't know anything about their affairs—it is possible, at least, that they may do it. They have begun in the treatment of the Sacramento River, if Congress makes any appropriation in regard to it. If I remain in charge of it, of course I am brought in connection with these subjects, and it is probable that some little assistance might in that way be got. Of course, both of those are simply problematical.

B. B. REDDING.

Mr. Ostrom—You can go on and make a statement.

Mr. Redding—I have given some attention to this investigation in consequence of the fact that my business is largely connected with the mines, and I have consequently to watch the effects of the mining debris along the banks of the various rivers. And in that investigation, the theory occurred to me which I did suggest before to a committee, and which I desire to suggest to this committee, and after you may question such gentlemen as Colonel Mendell, General Alexander, and Professor Davidson, as to whether it would be practicable—their opinions as to its practicability having weight, and mine, perhaps, not. It appeared to me, from looking at the map, that almost all of the unreclaimable swamp lands of the State, take, for instance, north—there is a tract of one hundred and twenty thousand acres north of the Sacramento, bounded on the south by the American, on the west by the Sacramento and Feather, and on the north by the Bear River, and on the east by the foothills—that was the first district that was attempted to be reclaimed under the swamp land law; a great deal of money was spent upon it, and its reclamation abandoned. Under any present known practical system it appears to be impossible. That tract of land is now useless, except it affords grazing for a short period after the water is run off in the autumn. The greater portion of it—and I am familiar with it—is from five to twenty feet below high water mark, on the Sacramento and American Rivers. When the river rises it flows back through the sloughs into that basin, and remains there. Then various streams from the mountains enter into little dry lakes and other creeks, so that all attempts to keep the river out but add to the difficulty, for the reason that it has the deepest drainage from the vast extent of foothills, from which the water could not be taken anywhere else, and the consequence is, it has been abandoned. Immediately north of that is Bear River, not in any way connected with this low basin. If you had a map, you could see the situation. Now, in eighteen hundred and fifty, up to about eighteen hundred and sixty, there was a large body of rich bottom lands on Bear River, which have been practically destroyed from the fact that hydraulic mining up on the head waters of Bear River they are tearing down the hills, and the sediment, or "slickens," as the farmers call it, has overflowed those lands till, I think, the railroad company has been compelled to raise that bridge twice or three times, to keep it above the overflow of the flood, and now it has been reported it has to be raised again. My idea in regard to these particular lands is this: I think that the ridge of high land between Bear River, and where the water-shed is on that side of this basin, is about fourteen and one-third feet above the bottom of Bear River at the present time. If a dam were put into Bear River and a canal cut through this basin, and all the hydraulic sediment turned into this canal—I have no means of estimating; of course, I don't know the amount of sedimentary matter passing through or the exact area—about one hundred and twenty thousand, that would receive this deposit for the next twenty-five or thirty years, and at the end of that time that tract of land, which is now a waste, and almost valueless except for grazing purposes, would be filled up to the level of the Sacramento River. This water from Bear River would fill into that, and where a stream makes itself into lakes its effect is to stop the current and throw down the sediment. At the end of twenty-five or thirty years, the bottom of that river would be raised up to the height of the Sacramento or Feather River, and that land now worthless would be then similar land, and it would be land similar to that land in Holland—it would raise large crops and be a source of revenue to the people in that vicinity. Then, if you take the other side, into what is called Reclamation District Number Five: if the same thing were done from the waters of the Feather River, turned in there, and allow this sediment to deposit, it will have the same effect there. The work has been partially done, and it is being successfully done, by the Cherokee Mining Company. They were having trouble, and law suits with the farmers. The railroad lands would not sell in consequence of that difficulty. This company purchased their land, and then came to the railroad company—California and Oregon Railroad Company—and purchased its land, by which they got a large body of lands together, at a very small price. They have turned their sediment in, confined it at the upper part by levees, turned it down over this land, have spread it out—naturally of its own action—and the effect is, they are making a very large amount of money of bottom land out of what was once an adobe. And by looking at the map, I say almost every portion of the State, where there is mining, and on the borders of those streams, might be so improved; and I think that these gentlemen who are conversant with the actions of water, and who are familiar with those lands—gentlemen like Colonel Mendell, General Alexander, Professor Davidson—should be consulted, and their opinion as to whether this is not practicable; other than that one case where it is practicable, would be a solution of the difficulty. I suggested that to a committee of the Legislature, and the question immediately arose, who is to pay for this work, and there it has remained.

Mr. Kercheval—Mr. Redding, if hydraulic mining is carried on to the extent it is now, and with the reasonable prospect of increase which everything indicates it will be done in the future, unless there is some means taken to dispose of the washings from those hydraulic claims, what will be the effect upon the rivers and the bays of this section of the country? Just give your opinion what the effect will be.

A.—If you were to examine the report of Doctor Logan to the Smithsonian Institute, as to the area of the Sacramento River at Sacramento, in times of flood, and the quantity of sedimentary matter in its current, the state of the river during the times he observed it, then you will ascertain the amount of material that is carried by that river. Then if you will imagine that is carried on at the rate it is stated by Doctor Logan, and multiply that by the number of years, you will get the result.

Q.—You then think that certain ruin will attend it?

A.—Colonel Mendell described it exactly as I think about it. The elements are all at work to tear down the hills and deposit them on the ocean, and it keeps working down, because water takes up what it lays down, and lays down what it takes up. Something will have to fill up eventually. I think first, the bed of the river, after that the sloughs, after that the bay. Any person's opinion, that is not scientific, is as good as mine. It is coming down, and it has to go somewhere.

Mr. Ostrom—Is it not your opinion, Mr. Redding, that the rivers, and some portions of the river also, may fill at the same time, and are filling—from this fact, that the coarser portions naturally will come last?

A.—No, the finer portions come last. The finer portions come further; and until the grade becomes sufficiently steep, the very coarse portion will not leave the mountains. But there is a sediment—a "slickens"—that is held in suspension by the water. This process of hydraulic mining, by forcing the water with such immense power against the earth, that it appears to impregnate the water in such a way that it is not still for a length of time before it settles, so that that latter portion will settle after it reaches the bay.

Q.—Don't you think the filling goes on in the bay, as well as in the river channel.

A.—I think the filling goes on, from my own observation, from on the other shore—the Alameda shore. There is also a deposit right directly—going on slightly—right above Point St. Pedro, where the river strikes there. Gentlemen like General Alexander could give you more information in relation to that. A theory about it, based upon some observation, that when the tide comes in here it goes north and south, and when that meets the current of the river, the current—a part of it—is placed, I find, on the other side, and more or less compromises there, as, for instance, in the vicinity of Point St. Pedro.

GENERAL ALEXANDER.

Mr. Ostrom—You understand the objects of the committee, General?

A.—Well, I don't know whether I do or not. I never heard of it until a few hours ago—didn't know there was such a committee. I suppose to investigate the facts, so far as you can get at them, about the harbor, from mining and agriculture, and what to do with it.

Mr. Ostrom—That is about the proposition. You can just make a statement, beginning at any point you think best, and give us what you can on the subject.

A.—Well, I have not made this subject one of special inquiry. I have traveled a good deal through the State, in the mountains, in the valleys, in the foothills, and generally kept my eye open, and saw what anybody can see going through there. I saw that debris, from the mines I suppose, has done more or less injury to farming land, and as it goes on increasing it may in time do a great deal more unless something is done to prevent it. The rivers are muddy now. The Sacramento River is, below the Feather, most if not all the year. It was generally a clear stream, except in the time of flood. Well, this sediment comes down and is deposited, some of it in the bed of the river, tending to raise the bed, and a great deal in Suisun Bay—some of it in San Pablo Bay; and as the waters come down some of it is left in this bay, particularly along the Alameda shore. I noticed it Wednesday as I came over. This is not the only thing that tends to fill up the river bed and these bays. I should think that the increase of agriculture, the plowing up of the land, making it more easy to be washed off, has as much to do with it as the mines. Some people think more. I am not able to form an opinion about it—about that amount. The debris from the mines comes down most all the year, and would come throughout the year if the miners had water enough, but the washing from the ploughed land only comes down during the rainy season, and only then when there is heavy rain, but it comes then in large quantities. Which of these two causes has the greatest effect to fill up the bays I cannot say, and I don't think anybody can say until there is a special investigation made by competent persons for that purpose.

Mr. Ostrom—You have never made any survey of the Sacramento River?

A.—No, sir. I have never made any special surveys. There were one or two little surveys made up there for particular objects, since I have been here, under my supervision; more to determine the slope of the river from Sacramento down. Below the fall of the river, from Sacramento to Suisun Bay, there is trouble in getting the exact fall from the railroad data, because they don't have the same plain records as we have in my office.

Q.—You have never made any observations in regard to the formation, or what composition this matter consists of—this sedimentary settling that is spoken of? You could hardly tell whether it was debris from the mountains or agriculture?

A.—No sir, I have not made any investigation on that subject, and I doubt if any investigation can determine that thing thoroughly; because the soil that is washed off from the agricultural lands is more or less like that which comes from the mountains.

Mr. Ostrom—I would like to ask you in regard to this opinion that I hear, of a great portion or part of this sedimentary deposit coming from the agricultural lands. You are familiar with the country, aware of the California mode of farming; you are also acquainted with the fact that in the upper portion of the State, in the great Sacramento Valley, and all those rivers that go from the mountains into the Sacramento Valley, that after they strike the valley it is almost a level, not a great deal of fall; the Sacramento River itself, I believe, has less than twelve inches at its swiftest current. Now it appears to me, the country being level and such a slow current, it would be the next thing to impossible for the water to wash the agricultural land to any extent. I will say further, I have lived in this part of the country since eighteen hundred and fifty and I have never known anything of that kind; and that was why I asked you if you were familiar with this part of the country.

A.—Well, twelve inches fall to the mile for a large river is considerable. The Mississippi River, for instance, down towards its mouth, don't have one-third of that fall, yet it carries large quantities of sediment. The Mississippi River has less than three, and the amount of sediment carried by the Mississippi into the Gulf of Mexico has been estimated by General Humphreys to make a solid mass of a mile square and two hundred and eighty-four feet high. A river with three inches fall to the mile will hold a bulk six hundred and forty acres square and two hundred and ninety feet high. Now, the Sacramento has a much larger fall; well, yet we drink this water there as in the Sacramento. The Sacramento has a greater fall, a much smaller river to be sure, but will do its part of that work.

Mr. Ostrom—I would like to ask you if you have never noticed, say of your own knowledge, in regard to this washing from the agricultural districts?

A.—Oh, I have seen it, sir. You go on the foothills, there; you see more than you do on the level. There the heavy rains take it from the gullies; that will run into the creeks. The creeks run down muddy and run into the river, and the river is run over in a flood. I have been up to Stone (?) Creek in a flood on two occasions, way above Jacinto. It is all muddy there in a flood. Now, where does this come from? It is not the mines. There is little mining up there. It comes from the plowing of the land. But it is clear in summer time.

Mr. Ostrom—I would state, General, that the discoloration of the water from cultivated land is not the same that it is from the mountain districts.

A.—We all are cognizant of that fact.

Q.—You mean not the same color?

A.—No, sir; different color. It is a blackish, a distinct color entirely. This mountain sand in the water is yellow—a yellow color; it is very easily distinguished. However. when the two become mixed, it would be impossible to distinguish which predominates. The mud in the Mississippi River is proven, by microscopical examination, to be almost sand entirely. It looks like it had been subject to excessive grinding, but still it is sand. I don't know that there has been any investigation on the Sacramento River. I suppose there are both—very fine sand ground up, so that is a powder, and also clay. Of course you take a test where it is a wretched clay, it will give only clay, blue clay entirely; and the rich agricultural lands, the adobe, the entirely dark soil, will give a still darker color, according to the nature of the ground. The further you go down the river the finer the material is.

Mr. Byrne—General, does it follow that because a stream is muddy ~~and carries~~ a large amount of earthy material in suspension, that there is a large amount of hydraulic mining on this stream, or along its tributaries?

A.—No, sir.

Q.—Will you state to the committee the quantity of earthy matter that is carried in certain rivers in Europe, or in Africa, or parts of the United States? What do you know about the River Po, for instance?

A.—Well, it has been a long time since I have read; I don't carry that information with me, except in book form.

Q.—Well, do you know about the River Nile?

A.—Yes; I have seen the Nile, and know it—in flood, too; the greatest flood they had in fifty years. Well, the material there is of a different color from any I have seen before—it is more of a pink color. What it is, I don't know, and I should think it was about as muddy, when I saw it, as the Mississippi River at New Orleans; but entirely a different color. You take it in a glass and you see the discoloration, very much as a glass of Spring Valley water here looked last week from these new reservoirs.

Q.—Now, how do the waters of the Nile and the Mississippi, as you have observed them, compare with the waters of the Sacramento, as regards this earthy matter, in time of flood—say in time of flood?

A.—Well, it would be almost impossible to answer that question. I think the Sacramento looks more muddy, though. I have seen the Sacramento and all these rivers in flood. The material of the Sacramento is undoubtedly coarser; does not travel so far.

Q.—But upon the Nile and the Mississippi there are not hydrulic mines?

A.—I don't know, sir.

Q.—Don't know of any—never heard of any?

A.—No, sir.

Q.—I want to ask you this question—you know something about the storage of water in the mountains, in the spring season—say in the winter season—I want to ask you what effect, in your judgment, the storing of these waters, and the subsequent turning it out in hydraulic washings in the summer time, has upon the currents of these streams—the Sacramento and its tributaries?

A.—My opinion conforms precisely to Colonel Mendell's. The storage of these waters holds back so much water, when the rivers otherwise would be high, and thereby prevents the rivers rising higher than they would otherwise do if the waters were free to flow. Then again, when these waters are let out, when the river is low, they add to the amount of water in the river, and make it greater than the river otherwise would have been, and therefore give greater depth.

Q.—From your observation and knowledge, can you say that the Harbor of San Francisco, or the outlet from the harbor here, has been decreased within the past years, or is it not about the same as it was fifteen and twenty years ago?

A.—Well, from my observation, it remains about the same. There has been a recent survey, by the Coast Survey, of the harbor, but I don't think that it is entirely completed, at least I have not seen or examined it. I don't believe, however, that the mining debris that comes down from the mines, which sometimes gets out through the Golden Gate, has anything, and if it has it is very little, to do with the formation of the bar there. I think that bar is formed entirely, or almost entirely, by the action of the sea—in heavy swells of winds. That it comes from the ocean—that the bar formation is from the sea. I had specimens taken up in a great many places, a few years ago, and specimens along the shores at different places, and also specimens in the bay, up as far as San Pablo, but it did not appear that the material on the bar was anything like that that comes down the river. I think scientific investigation will also prove that the bar is formed from the action of the sea, not from the river.

Q.—Colonel, I believe you are Chief of the Engineer Department of the United States Government on this coast?

A.—Yes; I am the senior Engineer on this coast.

Q.—What, in your opinion, would be the best way to solve this difficult question, arising between the mining and the farming interests, which we are all now considering? I think the committee would be glad to have any suggestions you may see fit to make, to get rid of this difficulty, which we all desire to have solved in some satisfactory way?

A.—It would be almost impossible for me to say, without special investigation, what would be the best way to solve it. It is a matter I have thought of more or less, and I have no objection to give the committee the benefit of my ideas. Mr. Redding has just given you an illustration, for instance, to cultivate the district between American River and Bear River; that, he thinks could be built up by the confinement of the sediment from the mines and the valleys. Well, I have often thought that could be done; if it can be done where this is, is more or less a solution. Now because you can do it in one district, it don't follow that you can do it in all, or that you can do it in any other. The case probably will be different all along these rivers, and in the different reclamation districts requiring some special device or solution, being different from any other. The only way to find that out would be by committee, or a board of competent men, to make it a study and find out what we can do. Find out where the material comes from, how much comes, its nature, and how far you can carry it, and what we can do. If you know these facts, it would be a very simple matter to say what ought to be done, and how to go to work to do it. I have thought a good deal too that the debris from these mines might be made useful, and this way: I am rather of the opinion that the Sacramento River, and if possible the San Joaquin to some extent, the Feather, too, ought to be made invaluable, and I believe if they had banks built on them, high enough and strong enough to keep off any floods,—banks like those in Egypt, at the Nile, for instance,—they have the same on the Po, too, though I am not so familiar with them—twenty feet high, fifty feet wide, two hundred feet of base—something of that kind—if you could keep all the waters in the rivers; I believe the flood would scour out these bottoms, and we would have navigable rivers. Now, if we could pick up the sediments in the valleys, and build flumes down, instead of letting it overflow the agricultural lands, and build banks down the Yuba and Feather—build a flume, and build levees on those banks, and keep the waters of those rivers within their channels, I think we would dispose of the sediment to a good purpose: it would benefit the rivers, and it would fill up the low land that would otherwise be overflowed. That is the idea. Now, whether it is practicable or not, requires investigation.

Q.—Does it not occur to you, General, that under the project that you speak of, that it would push all this coarser sand that now remains in the channel right down into the bay—put it into San Pablo Bay?

A.—Yes, sir. That bay is bound to be filled up by natural causes. From the confluence of the Sacramento and San Joaquin Rivers, there will be a deep, wide channel right through, like the Straits of Carquinez. You cannot prevent a deep channel there; nature will make that. But that bay is going to fill up anyhow, whatever you do. Has been filling up—will be the first one filled up.

Q.—Your attention was directed to rivers in foreign countries, that they carried sediment, earthy matter, from natural causes, where they did not have hydraulic mines?

A.—The only rivers I critically examined were the Danube and the Nile.

Q.—You have seen rivers in California that do not have hydraulic mining?

A.—Yes, sir. I suppose the Kern River has very little.

Q.—Well, do those streams run muddy all the year around?

A.—No, sir.

Q.—Then that thing amounts to nothing in this country? So those streams don't carry any stuff below the mouth of the river?

A.—No, the Kern River below the mountains is a clear stream. Between Bakersville it picks up what looks to me like nitre, and is discolored; but as it comes out of the hills it is a clear mountain stream.

Q.—Then the Mississippi River that carries this sand—the Mississippi water is drained through a large section of rolling country?

A.—The Mississippi is a perfectly clear stream until it joins the Missouri River above St. Louis.

Q.—But is there not a large proportion of the rolling country where it is plowed—does not the Mississippi drain a greater portion of that kind of country than the Sacramento does—to say nothing of the size of the river—the proportion of agricultural land that is rolling in its character? Doesn't it drain a much greater proportion of rolling agricultural land than the Sacramento does?

A.—I suppose it does. The land on the Ohio River is generally rolling, and all the upper part is rolling land.

Mr. Kercheval—You stated that the upper Sacramento is clear—the American River is clear in the summer season. Well, does it not fill, according to your judgment of the matter, with the mud then of the other streams—Feather, Yuba, and Bear Rivers—they are muddy all the year round—that is caused by these hydraulic mines?

A.—I should think so, sir. If you stop mining to-day, and stop for a month or a year, you won't make the streams clear. The debris is there, and it is coming down from time to time.

Mr. Ostrom—In that connection, General, don't you believe that, if the debris was put somewhere else, and the channels of those streams cut down into their old bed, would they not become clear as they were originally? If you could dispose of the mining debris in some other way?

A.—In answer to that, I should say the tendency would be to deepen the channels, but I don't think they would be cut down to their old bed—certainly not in a very short time.

Q.—You spoke, in the beginning of your statement, in regard to the filling of the reservoirs in the mountains. Now, is it not a fact, in your own knowledge, that they fill those reservoirs at the first opportunity?

A.—Well, those reservoirs are used for hydraulic mining generally. Well, as soon as it rains in the fall, and they get water enough, they begin to mine, and they run all fall a full head, relying particularly upon the higher reservoirs; and the rest of the season I don't think they let the waters run full. As soon as they get a sufficient storage, they begin to start their work.

Mr. Waters—Well, if that is the case, insomuch as they may use the water during the flood-time, that does away with that benefit—that is, it decreases that benefit just in so far as they may use the water.

A.—Yes; but it should not be overlooked that the trouble comes from great rains, and they may run full head in the mines. The quantity of water run off is very little compared with what is caught in the reservoirs during these heavy rains.

Mr. Byrne—Speaking about the waters of Kern River and the Sacramento River, above a certain point being clear, is it not true that about those places there is little agriculture carried on? For instance, in Kern River?

A.—There is very little there, but in the Sacramento, a great deal. That stream is clear in summer time and muddy in the winter time. While it is rainy weather, the muddy water is running off these lands through the sloughs and into the rivers.

Q.—During your experience in California, about what proportion of the time are the rivers muddy from natural causes, on an average—take the year as we have it, sometimes dry and sometimes wet, and sometimes between the two—what time would they keep muddy?

A.—Take away the mining?

Q.—Yes, sir.

A.—I have not taken special observations, but I think from three to four months, during the rainy season—middle of November to the middle of March. Perhaps late in the spring, too, the Sacramento would be somewhat changed.

Mr. Kercheval—What proportion would you judge—or can you form an idea of this debris that is carried in the water during the rainy time—what proportion would be from the natural washing, and what proportion from the accumulated debris in the gulches, where it has been deposited in the summer season by these hydraulic mines? What proportion from each cause?

A.—I have already stated I don't know that, and I think you will have to have a special investigation to find it out. If I had to guess I should say about half.

Q.—Mining goes on all the year, provided they have got water?

A.—Well, there are a good many mines, and the amount of work done is very considerable, but still the amount of space that they wash is very small compared to the great amount of land that is plowed.

Q.—Well, that goes on, however, all the year, provided they can get water?

A.—The amount of washing that comes down from the plowed land is confined to heavy rains—light rains don't wash it; it is only when you have heavy rains that the muddy water runs into the brooks, and the brooks into the creeks, and the creeks into the rivers.

Mr. Ostrom—How long have you been familiar with the waters of the Sacramento Valley?

A.—About eleven years.

Mr. Waters—Can you state, sir, about what proportion of the plowed land in the Sacramento Valley is susceptible to be washed by rains, and what proportion is flat and not susceptible to be washed—in other words, what proportion absorbs all the rain and what proportion drains off and runs into the river as muddy water? I mean the lands that you can see on the surface of them they have been washed?

A.—Well, sir, I don't think I could give a proportion. I can only say that the hilly lands do not absorb all the waters, and they run off; where there is a great slope the waters run off muddy into the creeks. The level lands do not run off so much, and in a dry season do not run off any—that is, in the winter season they are wet. But I have seen even in the low lands—I happened to be up at Sacramento, where we had four or five days heavy rain, and the water appeared to be running off even the low lands.

Mr. Ostrom—You know nothing then of the streams of the Sacramento Valley previous to seventeen years ago?

A.—I only know what I have been told.

Mr. Waters—I wish to ask the General this question; if there is any dead level land between the —— and the Sacramento River that is cultivated?

A.—Well, there is some of it very near level, down in the low lands, between the tules below Marysville, for instance, or as you go from Colusa, across to Marysville; I should think the most of that land is very near level. I mean, from the foothills to the tule lands the land all slopes.

Q.—Does it slope sufficient to wash very much?

A.—Some of it does, and some does not.

Mr. Ostrom—From the base of the foothills, which is really the edge of the agricultural lands of the Sacramento Valley, down to the edge of the tules, about what fall do you think it would have?

A.—Well, a great many of those foothills are cultivated and ploughed. Which side of the river do you refer to?

Q.—That is immaterial; either side. The east side we will say, for instance.

A.—Well, I think if you take the greatest declivity that the fall is six or eight feet to the mile. The question don't admit of an exact answer, because it would differ; there are places that would be different from all others. And if you send a lot of men there to drive a lot of stakes where the foothills are they will vary a great deal. The slope is greater towards the foothills, and gets less and less as it comes towards the river.

Q.—You never took any actual measurement?

A.—No, sir. But I have seen several cross sections of the San Joaquin Valley, on both sides, and I have seen some surveys made on the west side of the Sacramento River; one survey made by a Mr. Wyand for a canal there, and I have had one or two extensions made across there at Colusa, but can not remember the figures now. But you have a survey on file; if not, George A. Read, at Knight's Landing, has it, and Louis A. Garnett has or had some profiles taken of Colusa, from the river near to the foothills, that will give you the exact slope.

Q.—In regard to the San Joaquin and Kings River Canal, state what the grade of those canals were?

A.—I don't remember exactly, but I believe the grade was twelve inches to the mile; but whatever it was, it was too much, and the canal banks were dumped and they had to go to work and protect them; and the canal lower down is made on a different grade.

MR. REDDING

Was here re-examined by the committee, as follows:

Mr. Ostrom—Mr. Redding, was you acquainted with the Sacramento River previous to eighteeen hundred and fifty-seven and fifty-eight?

A.—I have been acquainted with it since eighteen hundred and fifty.

Q.—What is your recollection in regard to the Sacramento River in flood-times, in this particular; was it muddy in those times, like at present?

A.—Yes, but not so muddy as it is now. I was acquainted with the Sacramento and the Yuba, as far up as Downieville. The Sacramento at eighteen hundred and fifty was clear; so was the American River, in summer.

Q.—You say you have been acquainted with the American River; about how much do you think the American River has filled up since you have been acquainted with it—say where the old wagon road crosses it?

A.—Say twenty or twenty-five feet. Because there is a schooner belonging to Colonel Wright, around the mouth of the river been sunk, and has not been seen for twenty years. I should say the full length of the Sacramento was filled up on an average of twenty-five feet, and vessels laid around in the American River, and as late as eighteen hundred and fifty-three, small vessels took goods up as far as Brighton—up the American River, in steamboats. In fact, it was five miles up the American.

Mr. Kercheval—How much, do you know? Or can you give an idea what depth it is inside of Sacramento, and how much it has diminished in width?

A.—It has not diminished in width. When we first went there it was just as wide as the Thames London Bridge—nine and some odd feet. It has filled up so much that the gauge that they formerly used to determine the height of water in floods has been hauled and reset two or three times. Filled up at least, on an average, at least eight to ten feet in front of Sacramento. Of course in Summer time, when the water is low, it cuts a channel through those bars. These bars are all the time working down. The river picks up the sand here and deposits it below, and the bar is on that side, and then next year will deposit it on the other side, and so on, keeps gradually working down the whole deposit more or less.

Q.—Mr. Redding, how much has the low water-mark increased in the Sacramento River opposite Sacramento?

A.—Well, they still try to retain the original water-mark, because all the reports of Dr. Logan to the Smithsonian Institute were based upon the water-marks at a certain height, and they still try to retain that gauge. And in the flood of eighteen hundred and sixty-one and sixty-two the water rose in the Sacramento River twenty-four feet above that; therefore, that makes the water there twenty to twenty-four feet above the low water-mark. It became necessary for the Steam Navigation Company to determine what the depth of water was based upon that gauge; they therefore fixed another one at low water-mark, and both were in use—one for the use of the Steam Navigation Company, and the other based upon the original basis. Well, now, as I understand, there is a third—because it has risen. But all the time, when you desire to refer to the depth of the Sacramento River, to make the opinion for scientific purpose, it should be based on the original low water-mark, which was twenty-four feet below the height of the flood when it overflowed the city.

Q.—Well, how much was that below the low water-mark last year? We want to know by this inquiry how much the bottom of the river has filled up.

A.—I should think ten feet, on an average. Let me explain. A channel may be on the side next to the city, right where the gauge is, one hundred or two hundred yards above that—say where the water-works are—there will be a bar. Perhaps for along two years that bar will be moving down to where the gauge is, so the thing is constantly shifting. That is, that deposit of ten feet will not be at one place all the time. It is not a question that any person could positively answer. It is simply an opinion. There have been no measurements. In early days there was deep enough water all along Front street for the Chrysopolis or old Senator to lay right up against the bank. I paid thirty dollars to go up on the Senator in eighteen hundred and fifty, and we laid right up against the bank.

Mr. Garver—There are three gauges—the old original one, and then the next one, and then the next one; well, what was it with the second one when the low water marked zero on the original one?

A.—I think it was two or three feet. The low water-mark on the original gauge is two or three feet difference.

W. H. JOLLIFE.

Mr. Ostrom—How long have you been acquainted with the Harbor of San Francisco and the Sacramento River?

A.—I am not much acquainted with the Sacramento. Pilot in the harbor twenty-seven years.

Q.—If you can give us any information in regard to the question we are trying to investigate in regard to the shoaling of the water, and so forth——

A.—(Interrupting)—Yes, sir. The majority of the pilots believe that the southern part has been shoaling—either the moving, or the sand, or debris—but something shoaling the southern part of the bar—our impression—not to any great extent. Deposits getting larger. Now twenty-five or twenty-six foot deep is an uncommon thing. Fifteen years ago an uncommon thing not to have over twenty-five foot draught. One or two ships have struck the bar twenty-three foot, and another one twenty-one. Likewise Blossom Rocks; there we have got twenty-four feet. I know of a ship that struck twenty-four feet, and one twenty-three. Them ships did not find no twenty-four feet.

Q.—Do you know of any shoaling going on in the bay—any other portion of it?

A.—No, sir, not in the middle of the channel; of course, shoaling on this side, in front of the harbor. The current runs out on this side before it runs out on the other side; but whether it has an effect on this side, I don't know.

Q.—Have you ever noticed, in any part of the bay, or around the margin—around what they call the tide land—do you notice any increase of shoaling?

A.—No, sir. We don't go along there; that is out of our course altogether.

Q.—You are acquainted with the bay in the upper portion?

A.—Oh, yes. I have been a pilot on a vessel between Sacramento and Stockton. I have been pilot on the first steamboat that ran to Stockton. But, then, I have not been up there much since. I was only up there in forty-nine and fifty. I commenced my early career running on the river in eighteen hundred and forty-nine.

Q.—No trouble then?

A.—Oh, yes; we used to bump then, and get off again, because the channels were very little known. They thought it was a great event to go up to Sacramento.

Q.—You never made any investigation of this subject at all—never thought anything at all about it?

A.—No, sir; too scientific for me. The bar keeps gradually breaking all the time, but, say twenty years ago, we never had any trouble at the bar. It breaks more all the time. It increases if we have any kind of a bad winter; very bad all this time.

Mr. Kercheval—Does this seem to indicate shoaling?

A.—Yes sir. Not shoaling to any great extent; I suppose a foot or two. As I say, several ships struck on the bar. One ship twenty-three feet, called the John Bright. Now, Bradford, who made this last survey of the bar—I went on board with him when making that survey two or three times—I asked him to compare with the old survey. He said the old survey is a libel on the coast. I said, why so? He said, there is more water on the north part of the bar by considerable, and he staid there and marked it; and he said on the southern part it was shoaling. Now on the southern part it breaks regularly, and they have a buoy there; before, there was no necessity for it. You can see it break, and eventually, I suppose, it will be as bad as it is on the north side.

Q.—You say your opinion is, that according to this old survey that they make more water than actually exists on some portions of the bar?

A.—Yes sir.

Mr. Kercheval—We might know of this change if it had taken place between the first survey and the last?

A.—It must have taken place. Now, there are ships coming—take the Zealous here, the Admiral never allowed his ship to go across the bar; he would not allow his ship to go across the bar. She draws twenty-six feet of water. He went up and got all the charts, and still would not allow his ship to be taken across the bar. Now, she drew twenty-six feet of water. Now, we don't think anything of a twenty-five foot merchant ship.

Mr. Byrne—You say the Zealous was never in this harbor?

A.—Never over the bar.

Q.—I mean in here; didn't she lie right off the city?

A.—Yes; but in entering the harbor she did not go over the bar. There is another channel, the north channel—nine foot of water—right off the bar.

Q.—Why don't all the ships go through that channel?

A.—They can't do it. Steamers don't.

Q.—The Shah went out that way?

A.—I guess she did.

Q.—Well, Captain, do you know whether the shoaling of the bar is attributable to sand washed from the ocean, or matter coming from the bay?

A.—I don't know. It either shoals or the sand must move.

CAPTAIN CHARLES MAHON.

Mr. Ostrom—Captain, you understand about the line of questions that has been asked; you can make a statement; anything that suggests itself to your mind?

A.—The idea that suggests itself to my mind, from the idea of General Alexander, as to the formation of this bar. There is a substance that you bring up with the lead; you bring this substance up inside of the bar, and you go from the bar to the Farrallones and you fail to bring that up—it is the gravel from the hills. The further you come in from the Heads the greater this is. Now, outside of the bar, in a corresponding depth of water, you can't get that formation at the bottom. I take his idea, that this bar is made by the sea. It is an old matter. I have read Wilkes' survey of these bays, and I have read Pitt's, nearly one hundred years ago. He mentions that. And the general outline of the survey of Wilkes is a *fac simile* to the survey of Beecher; that is, so far as applying to the survey of San Francisco Bay. Of course he did not make such an extended survey as Wilkes has made. Now, in relation to what I have heard said about the shoaling of the bay. I have always had an opinion of my own as to the local cause on this side, and that has been this. I am an old resident of the place, and was here before a wharf was built, and my idea has been, that if a bulkhead had been built, and built with the ebb and flow of the tide, as it was formed by nature, that the ebb and flow of the tide would not have averaged as much as it has. Say here is a ship at right angles with the tide; any sediment that is coming down from up bay will come against that ship, and any sediment from that tide must also come against that ship from the opposite side of the wharf. Before we had steam tugs it was difficult to tug ships. That, I think, is one of the causes of the shoaling here. I call it a local cause, that is, on this side—and I think that is the explanation.

Q.—Are you familiar with the upper portions of the bay?

A.—Not to say very familiar.

Q.—Have you ever noticed any shoaling since you have been familiar with the bay, in the upper portion, that you had any idea come down the rivers, or did you have any real interest in the matter enough to notice it particularly?

A.—Well, I am ordinarily observant; that is, where my duty calls me. So far as this bar is concerned, I want to explain something about that. We hear pilots say that the bar is getting wider, that is, we pass there breakers now that we claim did not exist seventeen or eighteen years ago. But the water across the bar—that is, when you speak of the bar, I don't mean the side of the bar that Captain Joliffe spoke of—I speak of the bar proper, you have not the same water now; that the extent is wider. Now, whether that comes from in shore or off shore. Taking Wilkes' view of it, it must come from off shore, because if this sediment and all this stuff went out, you would certainly find it in a corresponding proportion outside of the bar as inside of the bar. As another further illustration, as a guide in taking a ship, Captain may ask you where is the ship, inside or outside of the bar; probably ask you how you knew. Now, if it is the night time, you can't see, not any lights, and you can't tell him otherwise than to take a lead and throw it overboard, and it, of course, brings up substance from the bottom, and look at it and determine you are inside. But if it was outside, you don't pick up that substance at all; you pick up sand and a little white shell. Now, in relation to the ships—the largest ships in the world go in and out of the bay of San Francisco. Now about this bar: You can go to-day and pilot a ship drawing twenty-six feet of water if so that you can lead and select a place for it; but if the wind is so that you cannot select a place for it, and the bar is what we call breaking, then that may strike; but if you can select a place for a ship drawing twenty-six feet of water, you can start at the proper time, and the ship will go. Well, the Harvest, he told me that he had five lengths of water. There are times when there are these excessive draughts. We have got to use a great deal of caution; but certainly those ships of this size come in and go out; have full cargoes going in, and full cargoes going out. Another thing about this tide, from my own personal observation: With the south shore it runs north and south; with the north shore it runs east and west. This west bank has existed—anybody can look at Beecher's survey—I think a hundred years ago; this bank existed there at that time; but this is only south. Just north, a bank—but I call it a sand nome—it is in length about the length of a ship. Now, inside of that there is a channel going down south; so the three branches of the tide, which meet in the same way, account, first, for the formation of the west bank, and next, for this sand nome down south. This sand nome is inside of the bar, and so is the west bank inside of the bar. The bar has the formation of a horseshoe—goes from one side to another.

Q.—Is there any other harbor on this coast, Captain, that could be called a good, safe harbor, except the harbor of San Francisco?

A.—No, sir; not till you get to Puget Sound; but between here and there that is the only place. At Portland you are aware of the loss that happened to ships within the last two or three months.

Q.—Ain't San Diego a pretty good harbor—ships from Liverpool go there?

A.—I think we have had three this season.

Mr. Byrne—Captain Joliffe, in his statement, spoke about the bar breaking more than formerly; don't the bar break less after heavy rains and floods in the interior?

A.—If there has been a heavy rainy season, we find that the floods wash out the bar to some extent. What makes the bar break is the sea coming in from off shore.

Here the Committee concluded to and did adjourn to Monday, February fourth, at nine A. M.

MONDAY, February 4th.

The Committee met at nine A. M., in the office of the Board of Harbor Commissioners. Present, Messrs. Ostrom, Kercheval, and Garver. Absent, Coffey and Waters. Mr. Byrne also present, as heretofore.

Mr. G. F. ALLARDT came forward, and said:

Mr. Chairman: If the committee please, I desire to submit an answer to a question relating to the Harbor of San Francisco, directed to me at the last meeting by Mr. Garver, the member from Nevada County. In this answer I have followed the views entertained by Mr. T. F. Arnold, the Chief Engineer for the Board of State Harbor Commissioners, who has devoted much time and study to this branch of the subject. I fully concur in his views, believing them to be eminently clear, sound, and practical. Unfortunately for the interests of the city, Mr. Arnold was prevented, by serious illness, from appearing in person before your committee, as he would state the case much clearer than any one else. I say unfortunately, for I believe that the City of San Francisco has as much, if not more, at stake in the correct solution of this problem than either the farmers or the hydraulic miners.

Mr. Garver's question was in substance this: Has the Harbor of San Francisco been seriously affected by the mining debris? (Reads from paper).

A.—No, not to any appreciable extent up to the present time, for the reason that the bulk of the mining debris, before reaching San Francisco Bay, has settled and been deposited in its two great settling reservoirs—Suisun Bay and San Pablo Bay, notably the former. But the danger from that source is none the less imminent; it is merely postponed, not removed. Suisun Bay is rapidly filling up; when that is filled, San Pablo Bay must follow, and then the injury to our harbor will become more apparent. Viewing these three bays as one great tidal basin, one-third of its tidal area will then be cut off, and the entire debris carried by the Sacramento and San Joaquin Rivers will be discharged directly into San Francisco Bay, causing a rapid shoaling of its shallower portions and, consequently, a further reduction of its tidal area. Now, it is admitted by the best authorities that a reduction of the tidal area, or rather of the tidal prism, in our harbor, will diminish proportionately its scouring capacity, and that a reduction of its scouring capacity will inevitably result in a material shoaling on the bar. The natural forces contending for mastery on the bar are supposed, at present, to be about evenly balanced. The forces from without, which tend to form the bar, are counteracted by the forces from within, namely, the tidal currents, which tend to remove it. A reduction of the tidal area of the bays would immediately destroy the equilibrium, and the bar would move toward the shore and increase in altitude. Eliminate the tidal currents and the Golden Gate would soon be closed, and San Francisco would become an inland city.

Mr. Byrne propounded to the witness the following questions:

Q.—How long, in your opinion, will it take to accomplish this result of which you speak?

A.—It is difficult to give any figures on this matter. Now, I can revert to Arnold's article on the subject. He stated that it was possible that Suisun Bay might be filled.

Q.—(interrupting)—I would rather have your own opinion than his, as you are testifying under oath, and Mr. Arnold is not?

A.—Taking that view of it, I would rather not give that opinion.

Q.—Then you have no opinion on the subject?

A.—No, sir.

L. L. ROBINSON.

Mr. Ostrom—Mr. Robinson, you are acquainted, I presume, with the object of this committee. Well, in brief, the object of the committee, at this time, is to gather facts and data in regard to the filling of our navigable waters, injury arising to the agricultural districts; also, the injury, if any, arising from the same source, namely, the hydraulic mines, to the Bay of San Francisco; and as this committee has allowed testimony of considerable latitude, I presume that we may continue to do so during this sitting.

Mr. Robinson—I am fully aware of the object of the committee, and I am rather familiar with all the questions at issue—rather, as much as any one can be; been a study of mine for many years; have large interests in hydraulic mines—large interests in ranch lands affected by the debris; therefore, I am interested on both sides of the question. I am interested in farming, also, and I own about eight thousand five hundred acres of land at the mouth of the two rivers, where I have probably had occasion to examine this question of debris from the rivers as much as any one, and also had occasion to see the power that exists in a very small stream of water in transferring large bodies of soil from one portion to another, because there is a range of mountains, or rather, the slopes of Mount Diablo lay in the rear of my ranch, and the water that runs there brings down upon my land a large amount of material, and in that connection I have had occasion to watch it, and examine it, and see what amount of debris a small stream and a small watershed is capable of contributing and bringing down, and has led me to examine that question with a good deal of interest. As to the question of hydraulic mines, I have been connected with the North Bloomfield Mine as its President, and Trustee, and promoter for the last thirteen years; and in connection with the operations of that company—which are probably the largest in the world—we have reduced our operations to a basis, and are enabled to give the power of water to move material; know exactly what we have had moved; know the amount of water to be consumed. Therefore, I am as capable to answer these questions as most any other person. I have traveled the different districts—almost daily upon them; crossed San Pablo and those bays all hours of the day and night, and all sorts of vessels. I noticed the filling up of the harbors, and the filling up also of the rivers, and paid a great deal of attention to it, and in order to save time and the answering of questions, I have reduced, in a general manner, my views to writing, which, probably, might be as well to read to the committee, and after that they can ask any questions they see fit, and I will give such opinion as I may be in possession of. If that meets with your concurrence, I will go on and read.

Whereupon, Mr. Robinson went on to read his written statement, as follows, to wit:

The operations at the hydraulic mines of the North Bloomfield Gravel Mining Company, in Nevada County, on the South Yuba drainage, where this class of mining is carried on upon as large, if not a larger scale, throughout the year, than in any other locality, and where all modern appliances, with a large volume of water under heavy pressure is used, show that it takes on their mine one miner's inch (or two thousand two hundred and thirty cubic feet) of water to mine out, wash away three and thirty-one hundredths cubic yards of gravel. This quantity of gravel moved would be much less per inch of water were it not for the free use of explosives in large quantities to disintegrate the ground, which is quite hard, so that the water can penetrate it and wash it away. It will, therefore, (for purposes of this calculation) be safe to assume, as the average result of all the hydraulic mining in the State, that one miner's inch of water mines and washes away three cubic yards of material. From all the information I can gather, coupled with a fair knowledge of all the various hydraulic mining localities in the State, I am of the opinion that not over ten million miner's inches of water is used in the State per year in hydraulic mining. This quantity of water will move and wash away not exceeding thirty million cubic yards of gravel. Of this comparative large quantity moved yearly, much the largest proportion, in shape of boulders and coarse gravel, finds a resting place in either the cañons in which the mines discharge their material, or in the beds of the rivers in proximity to the mouth of these tributary cañons, or near the outlet of the mining works which discharge direct into the rivers. A large portion of the balance of the material, following the law of gravity, is lodged in these main rivers, between these outlets and the plains at their mouths, and the material mined is thus deposited and distributed according to the law of gravity, the heavier portions first, until the Sacramento River is reached. The material which reaches the farming land below the foothills (in proximity to the mouth of these rivers) and which covers them is quite fine, and is well designated by them as "slickens." By the time the debris from the mines reaches the main river, the quantity held in suspense in the water will not average three per cent. of the amount originally moved. And by the time this reaches the lower rivers or bays, where it is finally lodged or deposited, it will not amount to two per cent. of the gravel mined. And while no examinations or experiments have been made to determine this matter, yet, it is believed by those who have given much thought and attention to the matter, that it will not amount to *one* per cent. of the gravel mined. Taking the quantity, however, at two per cent., it will only amount per year to six hundred thousand cubic yards—a quantity quite inappreciable in the great mass of material brought into the lower rivers and bays from other causes than hydraulic mining. This quantity of "silt," as I call it, would cover about three hundred and seventy acres only per year, one foot in depth. If the percentage is taken at *one* instead of *two*, it would only cover one hundred and thirty-five acres, same depth. This amount of material, it will be readily conceded, poured into the lower bays yearly, would have but little effect, either in filling the bays or interfering with our harbors. The great evil of which complaint is made, to wit, filling our lower rivers, bays, and harbor, arises from and upon a much larger area than that operated upon by the hydraulic miners, and is very much more extensive in its operations, and should not be charged upon the miners at all. It cannot be denied that much the largest portion of the immediate damage to the farmers near, or at the mouths of these mining rivers (by covering their lands with "slickens"), is due to mining operations, yet even this is not due to mining alone. This class of damage is local, and can, without doubt, be grappled with and justice be done to both miners and farmers, and the evil itself, in a great measure cured, by utilizing this "slickens" in filling up land, and making valuable that which is now considered worthless. This cannot be done by litigation. It can only be done by wise legislation, aided and guided by information and results which can only be arrived at by a "non-partisan" commission of scientific men, free from all local influences and interests, who shall make this examination a specialty, until the subject is exhausted. The great evil, charged upon the hydraulic miners alone, of the filling up of the lower rivers, bays, and harbor, arises from two causes, exclusive of their operations, but aided, however, in a small degree, by these operations of the miners. These causes are: First, natural ones; and second, principally from the operations of the farmers themselves in following their agricultural pursuits. There is about twenty thousand square miles of area north of the mouth of the San Joaquin River draining into Suisun Bay, about thirty-four thousand square miles south of that point, and some two thousand square miles drawing directly into the San Pablo and San Francisco Bays. Upon this vast area the surface washings from the winter rains which finds its way into the rivers has been increasing yearly from following causes: The destruction of the timber upon the mountain slopes has opened the soil for the action of the elements; the operations of the agriculturists in breaking up the surface of the soil has also rendered it more liable to the action of the elements, and opening of roads, railroads, and canals, together with improvements of all kinds upon this vast area, all tend to a yearly increase in the amount of material which is washed away from the surface of the ground yearly into the smaller tributaries, from thence into the larger ones, and so into the main rivers and bays, where it finds its resting place. There is no mode of ascertaining, with accuracy, what this surface washing will average per year. In some portions of this vast area it is very large; in others less, and in some—in rocky sections—it is very slight indeed; but the aggregate quantity following the immutable law of gravity is very large. The mountains are constantly moving to the sea, and will continue to move so long as the world exists. That this natural movement, which is slow, but vast and perpetual, can be aided by human means, no one can doubt, and the most extensive human aid arises from the operations of our agriculturists. We can measure and gauge with much accuracy the gross effect of the operations of the hydraulic miner, and have done so approximately, but who can measure and gauge with the same accuracy the effect in the same line of inquiry of the operation of the never-ending laws of nature, aided by the myriad hands and appliances of the agriculturist, the artisan, and workman, exclusive of the hydraulic miners. There is but one way of arriving at comparative results, in this stage of examination, and that is by comparison. We know, with some degree of accuracy, that the total quantity *moved* by the mines is thirty million cubic yards; taking this quantity and spreading it over fifty-six thousand square miles of area, draining into the lower bays and harbor, and it would only be equal to an average depth of about one one-hundred and sixtieth of an inch—which is about equal to the thickness of an ordinary sheet of writing paper. As but one-fiftieth part of the thirty million cubic yards, moved by the miner, reaches the lower bays, even under the highest estimate (or six hundred thousand cubic yards yearly), this would be equal, if distributed over the fifty-six thousand square miles of area drained into these bays, to a depth of only one eight-thousandth part of an inch in thickness. It is believed that the average annual surface washing from this vast area is not less than one-fortieth of an inch in depth, and that of this material, thus disturbed, at least *ten per cent.*, owing to its lightness and finely disintegrated or —— character, finds its way into the bays, which would be equal to about eleven million five hundred thousand cubic yards, as against six hundred thousand cubic yards from the mines. It will, from the foregoing calculations, be seen that the evils charged upon the miners alone, by the agricultural interests—of filling up the bay and harbor—really arose in much the largest degree from the agriculturists themselves. If the mines must be closed, in order to arrest this evil, then agricultural operations upon this vast area must also cease. Even were both to cease, the filling would still continue, in a modified degree; for so long as the law of gravity exists, so long will the bays be the receptacle of the "silt" of this vast area. These matters are so extensive in their operations and results, involve so many and such vast interests, and cover such a field of inquiry, that no positive information can be arrived at except after long, careful, and special inquiry and examination by proper scientific persons free from local interests or influences.

Mr. Kercheval—You stated that not over two per cent. of that reaches the lower rivers; now, where is all this vast amount being deposited and going to be deposited in the future? Are not the places that it would naturally deposit in already filled, so that from this on the whole mass must move into the Sacramento Valley somewhere?

A.—Yes, sir. But that amount in the valley is such a small percentage of the vast quantity that is poured into the lower rivers. It never reaches the lower bays.

Q.—Where is it being deposited?

A.—Being deposited in the cañons above.

Mr. Ostrom—Will not they fill from them mines, according to your own statement—very soon be filled?

A.—Not before the mines are exhausted, sir. The capacity of the cañons to receive that quantity of material is much greater than the quantity of material in the mines to be exhausted.

Q.—Now, you spoke of the San Joaquin; can you give me the reason why the San Joaquin is not filling as rapidly as the Sacramento?

A.—I especially speak here with reference to the bays and harbors, not with reference to the upper rivers. I admit that the farmers at the mouth of the two rivers are injured in a large degree by the operations of the hydraulic mines. That is local. When you come to the lower rivers here, and the harbor and the bays, it is a general question, and occupies a very different position. My memorandum has reference to that.

Q.—Colonel Mendell thought that two-thirds, probably three-fourths, of all the debris came from the hydraulic mines?

A.—I think that Colonel Mendell has probably never been in the mines. If he had examined it thirteen years, as I have, he would probably come to a different conclusion.

Q.—How many cubic feet of water do you estimate is held in those reservoirs for summer use—that is, how much will they hold when they are full?

A.—Say that in the North Bloomfield Company will be probably eight thousand million cubic feet—say seven or eight thousand millions. I can't answer that. As to the filling of the San Joaquin being less, one reason is that all the western portion of the San Joaquin is comparatively dry country, and the agricultural operations are quite limited as compared with the eastern side, or both sides of the Sacramento. All are familiar with the fact that the west side of the San Joaquin is a very dry country; but that the San

Joaquin river deposits quite largely, I see every day; and the flow that comes over my land is not from the San Joaquin River.

Q.—Have you examined it up to Stockton?

A.—Stockton is not on the San Joaquin; it is on the slough. I have examined it clear to the Heads.

Q.—Do you find it in as large quantities to exist as below?

A.—Oh, no.

Q.—Do you not know that the Mokelumne waters is greatly made up from the Sacramento by the Georgiana and those other sloughs emptying in it?

A.—Sure.

Q.—Is not that the reason that the greater portion of this slickens goes from the San Joaquin?

A.—I don't think it. The lower San Joaquin is filled—you can see it every day. The whole country is filled, more or less. Undoubtedly more material comes down the Sacramento below the mouth of Feather River than from the same section of the country in any other river in the State, because all the debris of the mines that reaches the river is poured in from that place. There is no dispute as to that.

Q.—Then there is no dispute as to the fact that the greater portion comes from the hydraulic mines?

A.—No, sir; because we know what portion comes from the hydraulic mines.

Q.—How with the Upper Sacramento River?

A.—The Upper Sacramento, in low rivers, is quite clear, but in flood-times is far from being clear.

Q.—Well, is the Upper Sacramento, above the mouth of Feather River, filling as rapidly as the Feather and Yuba?

A.—No, because the land fills more, and has a greater tendency to scour.

Q.—Is it not now, in your opinion, more from the very fact that there is but very few—any hydraulic mines being above the Feather River but would discharge in the Feather River? Is not that the reason why the Feather River is not? If there were mines above as much as below, the Sacramento would be?

A.—That is a limited portion of this question. I am not speaking of the Upper Sacramento.

Mr. Ostrom—We are investigating to find out where this debris comes from. It don't matter whether it comes from the San Joaquin, or Sacramento, or Mokelumne, or what place; we want to know what is the cause of the removing of this vast amount of material that is filling and destroying the navigation of the rivers, and which we fear eventually will destroy our agricultural lands—if it is not certainly in large proportion coming from these rivers?

A.—Not more than I spoke of. I have had an observation of thirteen years.

Q.—It is then a matter of opinion?

A.—Not so; that opinion I have arrived at by thirteen years observation. I was going on to state the power of a stream of water to move material. I have taken this from close measurement. Taking my own ranch, where a stream called Perkins' Creek crosses my ranch and empties into the San Joaquin River. That stream has deposited—and I don't think the area there by that stream will exceed twelve square miles—the total that stream has deposited upon my land in the last ten years, is over two and a half million cubic yards of material, independent of what has passed into the river. And that stream only runs during the rainy season, except when the coal mines there are pumping out a little water. It then only lodges in the cañon, and the rains sweep it out.

Q.—Where does this stream come from?

A.—Nothing more than the ordinary rainy season—from the northern slopes of the Mount Diablo Range.

Mr. Kercheval—In regard to the San Joaquin River. How much more material is now held in suspension by the waters of that river than ten or fifteen years ago?

A.—When I first knew the San Joaquin River—when I had occasion to examine it—was about thirteen years ago. Then the San Joaquin River was, you may say, comparatively clear as to what it is at the present time, and there was very little deposited by the inflow of the tide and the outflow of the tide upon the low lands of this ranch. I have seven miles of frontage, and the most of that frontage is overflowed lands. I had to levee it in and did levee it in eighteen hundred and sixty-five, and portions of that levee were afterwards swept away, floated away, and allowing the tide to ebb and flow.. The tide rises and falls five and six feet. In very dry seasons of the year the water will be got passed. As the tide rises and falls it will flow in upon these lands; and for some years the deposit of sediment was scarcely to be seen; but of late years, in the last seven or eight years, the deposit with the inflow of the tide is very perceptible. Therefore, I judge from that cause alone, seeing it daily—twice a day—that the amount of material deposited by the San Joaquin River is largely in excess of what it used to be.

Q.—To what is it due?

A.—Increase of agricultural operations; the breaking up of the soil by the people who are farming; to a variety of causes.

Mr. Ostrom—Do you not think that the increase of sediment is by the debris from the mines coming into the Mokelumne River and falling into the San Joaquin?

A.—That would be only in high water, not in low water; because in low water it would pass through.

Q.—Above the City of Stockton, on the San Joaquin, what is the character of the water up there?

A.—The character of the water is comparatively clear, in low water; but in high water, in flood-times, it is anything but clear. It is only in flood-times that this large amount of slickens is brought down.

Q.—Are you aware that the channel of the San Joaquin that high up is filled at all?

A.—I don't think it is, because the current is quite rapid, and the level soil is of so light a character that it must get down. It will not stop in those rivers. If it has any filling going on at all, it is very light. I know it has some filling, because from this fact, that during the high waters the Mokelumne River might pour in a large quantity of this sediment into the Lower San Joaquin, and then it would gradually wash its way into the bay. It will pour in more or less during high water. But that stuff held in that place is apt to follow the current. It will follow the great main river, the largest percentage of it, and that which comes into the Mokelumne Slough would be a very small portion.

Q.—Have you ever been over the Georgiana Slough?

A.—Not lately. I have been over the Three-mile Slough?

Q.—Quite a large slough?

A.—Yes, sir. Tried to get through it in sailing boats, and couldn't get through it.

Q.—This farm you speak of, where is it situated?

A.—At the mouth of the San Joaquin.

Q.—You cultivate it?

A.—Yes, sir.

Q.—What quality of soil is it—a tule ranch, or the foothills land?

A.—One thousand five hundred acres tule and seven thousand acres wet land.

Q.—Rolling land?

A.—Little rolling—low land—flat land. That tule land will vary from one hundred feet in width to a mile in width.

Q.—You speak of the small quantity of this mining debris reaching the lower waters of the Sacramento and reaching the bay; are you not aware that the Sacramento River is not filled with this slickens, but a coarse sand?

A.—I am not aware of this, Mr. Chairman. I have built the first railroad in California—the Sacramento Valley Railroad. Of course, passing up and down the rivers then, and since, rendered me very familiar with them. Had occasion to examine those rivers, and know a good deal about them. Been familiar with them since eighteen hundred and fifty-four. I have reason to know this; and believe that the whole of the upper rivers, from the foot of the mountains—from the foothills—is filling; the whole country is raising—we all know that; that is the law of all alluvial rivers. I have seen it all over the world—the Po, the Rhone, the Rhine. I have seen it in all the rivers. Been a study of mine. And the same laws are going on in California as is going on all over the world. But not owing to the hydraulic mines alone: other things, including that, bring about that. Take the rivers in Europe, that we now have thirty and forty feet above the plains; that has not been done by hydraulic mines. That is not due to mining; to other natural causes. The same laws are going on here as are going on there.

Q.—You say you are acquainted with the Sacramento as early as eighteen hundred and fifty-four. What was the color—wasn't the water clear at that time?

A.—No, sir; when I first saw the river, quite muddy. Went up the Sacramento River on the Richardson G. Hunt in the fall of eighteen hundred and fifty-four, and the water was not clear. Now, the operations of the agriculturists, on the slope of the Sierra Nevada Mountains, break up the surface of the soil; we all know that the washing increases, because if a gully once forms that increases, keeps on increasing; and any one may travel on the west side of the San Joaquin—and if you start from Oakland to go to Martinez, go on the slopes of those mountains, you will see farms after farms destroyed by this washing.

Mr. Ostrom—Do you not believe that on the Feather River, as low down as the mouth of Feather River, that there is enough of that earthy matter—that debris—comes from the Smartsville Mine alone, without this slickens and sand?

A.—From the one mine? Indeed, very possibly. I have never measured that. We know that it will move.

Mr. Byrne—Do you know how much money has been invested from San Francisco alone in hydraulic mines throughout this State?

A.—I have made an approximate, having been familiar with the country for many years. The estimate is not less than fifty million.

Q.—What would you put the total value of the hydraulic mines, and the ditches made for the purpose of working them, in this State—the value of the mines, and the ditches, and the reservoirs?

A.—Oh, so large, it is impossible to say. You may say anything from fifty to one hundred millions. It is very large—very large. I know one or two corporations that have expended between four and five millions.

Mr. Ostrom—Do you believe that the hydraulic mines are paying six per cent. upon the total investment? Have you any knowledge of the fact that they are paying any interest whatever?

A.—Oh, yes; some of them paying large interest. I should say, as a class, they are paying more than six per cent.

Q.—Considering total expenses—running expenses?

A.—Yes, sir.

Mr. Byrne—As you are both a miner and a farmer, what percentage per annum do you think the agricultural lands of this State pay upon their estimated value?

A.—Well, my experience is three or four per cent. At present they are doing a very large business. I don't think they will average that.

Q.—Are you not aware of the fact that the Sacramento Valley is by far the most successful portion of the farming portion of the State?

A.—You mean the Upper Sacramento Valley, above the mouth of the San Joaquin?

Q.—From San Francisco north?

A.—Undoubtedly, sir.

Q.—Do you not believe that the agricultural prosperity of this State depends in a great measure upon the preservation of what is known as Northern California?

Undoubtedly Northern California has a vast deal to do with the prosperity and welfare of the State. Its yield is very large in grain; there is a vast area in cultivation.

CAPTAIN DAVID GILMORE.

Mr. Ostrom—I presume you are aware of the object of this committee, Captain. It is to ascertain in regard to the fact of the injury, if any, to the Bay and Harbor of San Francisco, as well as the navigable waters above, from mining debris. Just proceed and make your statement in your own way.

A.—I don't know anything about the upper water; I only know about the bar. I have been going out and in for eleven, very nearly twelve years—four years as first officer of a ship, and eight years Master. The first time I found six fathoms, and never found any less since. I have often found more, and that is the least.

Mr. Byrne—Have you been accustomed to bring in large ships?

A.—Yes, twenty-three feet; Master of the ship Equator for six or seven years.

Q.—Have you been accustomed to make frequent soundings of the water on the bar?

A.—Mostly every time I came in.

Q.—You say that the water on the bar has not shoaled any within the past eleven years—within your observation and experience?

A.—Has not shoaled any as far as I know.

Q.—Do you think that the bar is changeable, or, in other words, is it sometimes deeper water and shallower water, or do you have a difference if you strike it in different places?

A.—I have not found any difference. I believe south there are shoal patches on the bar, but I have not found them. I always try to get in a channel when I come in.

Q.—One of these gentlemen testified that there were some vessels, however, never taken over the bar—taken out of different channels?

A.—Yes, that is a deep channel, ten or eleven fathom, but too narrow for practical use.

Q.—You are not familiar with the soundings in the harbor?

A.—I don't know anything about the soundings in the harbor.

HAMILTON SMITH, JR.

Mr. Smith testified as follows:

My business is that of civil engineer; been engaged in that all my life, and for the last eight or ten years devoted almost exclusively to hydraulic engineering. I would like to make first, some statements in regard to my estimate of the present value and prospective value of gravel mines throughout the State. I have examined a great many of them, and therefore familiar with a good many of the claims. I should estimate that there had been expended of San Francisco capital, I think, at least anywhere from thirty-five to fifty million dollars in these mines; very hard to tell how much. Not less than thirty-five, and very likely fifty million. More likely fifty than thirty-five. So far as the total value of the mines now, I should certainly say they were certainly worth one hundred million throughout the State—entire value of them. The production of gold from the gravel mines now, it is hard to tell. The total production of gold from California is between eighteen and nineteen million dollars a year. That production has been increasing for the last three (3) years, until, I believe, within four or five years, if nothing is done to interfere with mining, the production of the precious metals will amount to as large as twenty-five million; and what I have seen of the extent of the mines, I believe that production will extend for many years to come. I believe, in fifty years, as productive, probably much more so, than at the present time. In looking about the mines, I have noticed what portions of the State are dependent upon them. I find—I have a statement here which I would like to submit, showing the population of the counties which are almost absolutely dependent upon them. (See Exhibit D, at end of Mr. Smith's testimony.) I find that, taking the population as shown by the last census, that it was over a seventh of the entire population of the State residing in those mining counties. And of what I know of those counties, if you stop the hydraulic mining it would simply destroy them. For instance, Nevada County—it wouldn't pay to keep up the county organization. Of course, not all the persons living in the county are engaged in mining, but many of them are engaged in agriculture, and agriculture is connected with the mining. If you stop mining you simply destroy the twenty thousand people in the county, and all property in the county.

Q.—What proportion of the total product of the gold mines comes from the hydraulic mines?

A.—I think that, last year, of the eighteen millions, eleven millions came from the gravel mines. It was a very bad year, indeed, as we all know; very dry, indeed. I believe that this year the production from the gravel mines will be at least fourteen millions from the mines alone.

Q.—Was not the production greater last year, or less?

A.—The production was greater; was greater, on an average, than it ever had been. I think, from the gravel mines alone—I think it was perhaps a little less. But this year, with a fair season, owing to the new mines which we have been having opened, and now fairly at work, the production will be increased, and the production, therefore, at least two millions more.

Q.—You say these gravel mines are constantly being opened, and a great increase in the quantity of ground worked every year?

A.—Not so much an increase in the quantity of ground as increase in the value of the ground. A large amount of the ground first washed has been surface gravel. Now the miners have got more money, and they run deep tunnels, which have cost large money, and through those tunnels they have been enabled to wash the bottom gravel. That bottom gravel is richer than the top gravel, and they will make more money out of it.

Q.—How do you obtain the bottom gravel?

A.—They wash off the surface. The surface is washed off. In the Bloomfield, the surface was washed off before we cut the tunnel.

Q.—You state the quantity of material that was taken from the hydraulic mines at eleven million?

A.—I should guess that. I believe from what I have seen that the yield from the gravel mines will increase, until it might reach twenty million.

Q.—In regard to the working of some of those deep gravel mines, are there not some of them worked in the shape of drifting?

A.—Some of them, but it is only a small part of the production of the State which comes from them.

Q.—Do you find it more economical, or is it for lack of water?

A.—Generally the drifting is done where the gravel is covered with lava, and where it is impossible to wash it.

Q.—I understand there are some of that class of mines at Dutch Flat and that vicinity worked in that way?

A.—No; no mines in that vicinity—not that vicinity—some north of it. I would say, too, that the gravel that is taken out from those drifting mines, that is all washed into the rivers, just the same as ours, only on a small scale.

Mr. Byrne—Is not the material which composes the bottom gravel which you speak of—is not that heavier than the top, and less likely to wash into the valleys?

A.—Yes, sir.

Q.—What proportion of that lower gravel washed is large stone?

A.—A large proportion of it. There has been a great change in late years. In old times only very small streams of water were used in the mines. Impossible, therefore, to get large bowlders. Now they think nothing of using three thousand inches of concentrated water.

Instead of using as old times small flumes we have large flumes and large streams of water—rather a little river in one stream. By the aid of that quantity of water we are able to wash large stones—see frequently a mass of stone weighing a ton and a half washed right out into the river. In old times those stones were blown into small pieces, and carried down into the rivers, and washed in the South Yuba River, going down say half a mile. I judge that effect is very plain there. The filled up Yuba River is a deep cañon, and fills up in places as much as one hundred and fifty feet.

Q.—What proportion of this bottom gravel is stone, and which would not, under any circumstances, wash down into the lower rivers?

A.—Half—in some places more than half—that would not wash beyond the cañons of Yuba River. Now, as to the quantity which is washed from the mines, I don't know enough about to state exactly. I should say that anywhere from ten million to fifteen million inches we use every year in the State. That is, inches for twenty-four hours. I think that, as an average, one inch of water will wash two yards and a half. At Bloomfield we have a very good grade, and wash between three and four yards there. At Pierce's mine, even less than two yards, and other mines I should judge that two and one-half yards would be a fair average. Each miner's inch will wash two and a half yards per day. Thirty to forty million cubic yards would be washed every year. Now, as to what portion of that goes down into the lower bay, I have rather the same opinion as Mr. Robinson; it is a matter of guess work, of course. One cannot tell without careful investigation to ascertain that fact. But by far the larger portion is carried into the Yuba River, and remains in the Yuba River. As the Yuba fills up, the bed of the river rises, getting more fall; it would year after year carry it further and further, the heavy sediment. The sediment is so very heavy in there, that it has got to remain there. It is hardly sediment; it is immense stones there. I have seen stones washed from there—the largest I have seen in one of our flumes, the stone must have weighed four tons.

Q.—The question was, as the bed of the river rises, will not the force of the water be such that it will carry the heavy stones further and further, till eventually it may reach Suisun Bay?

A.—It would do that, but these large boulders act as dams to hold it. You can see the washing of these large stones into the river has the effect of holding the sand and tailings back.

Q.—How long before these receptacles, holding the stones, will be filled up?

A.—Oh, an immense number of years. The Yuba cañon is an enormous cañon.

Q.—You are estimating work for fifty years?

A.—Well, not fifty years: there will be a great deal of space then.

Q.—How far up are the mines located?

A.—The lowest at Smartsville. The most extensive are much higher up the river, forty, fifty miles.

Mr. Byrne—Don't you think the cañons are large enough to hold all the gravel that ever may be washed from the hydraulic mines?

A.—Very much more than that. I should not judge that over two per cent. of the material which is washed from the mines comes from the river and gets into the bay. No one could determine that unless by a careful and extensive system of measurements. I have made some examination, noting all the authorities which were at my hand as to the amount of material which the different rivers in the world carry, the amount of sediment held in solution. It is admitted that the river Po carries the largest amount of material in suspension than any river in the world. It is estimated by the hydraulic engineers that the Po carries for every three hundred parts of water, one part of solid matter, which is larger than what any other river carries. In spite of carrying that amount of material the bed of the river has not changed in the last two hundred years, the engineers are assured it has not changed more than three or four feet. But in order to protect the adjoining lands they have built up levees, sometimes as high as forty feet, and in spite of carrying that enormous amount of material, which is much more than any other river carries, still its bed does not change materially. Perhaps that fact is due to the sure way in which it is leveed—keeps an open channel. Just so with mining sloughs, they don't fill up at all, though we run an immense amount of material. It is the natural filling, because the Po carries about the same depth of water that it did three or four hundred years ago. Those levees were completed two or three or four hundred years ago; they were commenced about two thousand years ago. In comparing the Sacramento River with these other rivers, the only examination of the waters of the Sacramento that has been made thus far is by Doctor Logan, and I think it is incorporated in a report to the Smithsonian Institute. He estimates that there is one part of earthy matter to over one thousand parts of water—as against the Po with one to three hundred; so assuming Doctor Logan's figures as correct, the Po carries six times as much water in solution as the Sacramento. Humphreys and Abbott, in their examination of the Mississippi, have found that the Mississippi, at Memphis, had carried one to one thousand one hundred and thirty-two, or nearly twice as much as the Sacramento. I have been familiar with the Mississippi and the Sacramento, and I think from my own observation that the Mississippi is a much muddier river than the two at times of flood.

In regard to the point as to how much sediment comes from the hydraulic mines, and how much from the natural and agricultural causes, of course that is merely guess work. In these rivers which I have spoken of before—in the Mississippi, and Po, and Nile—these are colored from natural and agricultural causes. That the cultivation of the soil will increase the amount of material coming down a river I know from the Ohio River. One hundred years ago the Ohio was one of the most clear and most beautiful streams of anywhere in the world. It was called the beautiful river by the French people who first discovered it. Even of my own knowledge of the river, which is within the last twenty-four years, it has changed its character immensely. Twenty-four years ago the river was clear at low water; pretty muddy—not so very muddy—at high water. Now, I saw it a year or so ago; it is very muddy even at low water. That change is, of course, simply due to cutting the timber away and allowing the cultivation of the ground—plowing up the roots, and disturbing the soil—and the heavy rains wash that into the stream.

Mr. Ostrom—Do you not know that the country through which the River Po runs, and also through which the Ohio River runs, and all those streams which you have enumerated, have gone through a rolling, hilly country—the agricultural portions there are rolling?

A.—The River Po—the country which it drains resembles California. The valley is very flat—the plains of Lombardy. The upper portion of its drainage comes from the Alps, and the lower sets in from the Appenines, which resemble on the one side the Sierra Nevada, and on the other side the Coast Range. I should say this, that very much more of the material coming into the Bays of Suisun, San Pablo, and San Francisco is coming from the natural and agricultural causes than from the mines. As I said before, it is simply a matter of guess work, All the most valuable land has been made by the washing down from the mountains. All these low lands up the Sacramento, nearly have been washed down from the mountains, and I, for myself, can't see what great harm is to be done if San Pablo Bay should fill up. The land thus formed by this filling will certainly be as fertile as any to be had in the State, going to result in an addition to the productive area of the State to a great many thousand acres. The Dutch in Holland are spending two hundred and fifty dollars an acre in reclaiming *ziderza*, in pumping the water out. Now, as to the damage which has been done to the Sacramento and the Feather Rivers by the deposit of sediment; no matter from what cause it comes, I think that this is very much exaggerated. For instance, the statement of Captain Corlett; it seems to me that that was, to say the least, a very wild statement. I have made some sketches I would like to submit. (See Exhibit A, end of Mr. Smith's testimony.) I think every one acknowledges that this entire valley has been filled up by natural washings from the mountains and from the upper valleys. As far as the diminution of the carrying capacity of the various rivers is concerned, I think there is vastly greater danger from these levees, this system of reclamation, every man on his own hook, every district on its own plan—that the Sacramento and others are in far greater danger from that influence than from any accumulation of tailings—I should say ten times as much. And that is one of the reasons that I entertain, to have a scientific commission appointed to investigate that subject.

Mr. Ostrom—What is your opinion in regard to the reclamation, and the meeting of this difficulty in all its phases?

A.—I think that they can be reclaimed.

Q.—Well, to take the two in connection, for instance?

A.—Well, I would like to make a statement. General Williams is building the largest levees put up yet. He is putting over a million dollars in different levees. In one place, at the mouth of the San Joaquin, Mr. Hall was telling me that the width of the stream has been contracted to very narrow limits indeed. I understand, from Mr. Hall, that it is contracted within comparatively a few yards where naturally there has been a water-way of miles. Now, if this levee stands, it is simply going to result in piling the water back on Stockton; and if the levees on Grand Island stand, it will naturally result in backing the water up and flooding Sacramento. There ought to be a complete system of levees. Every levee which is built on the Sacramento or San Joaquin will result in necessitating the other levees higher up the stream to be also increased. That is the result in the Mississippi, Po, and every stream of the world.

Q.—What system can you adopt to prevent this?

A.—You can not. Probably by canals this might be prevented.

I am of the opinion that a scientific commission should be appointed, because if there should be a great flood, damage might be done to Sacramento and to Stockton, and I think the real cause, the great cause, would be these levees. That is, if you build levees strong enough to stand, so that they won't be swept away, it will certainly result in backing the water up above the levees. For instance, in the Mississippi they built them a few feet, which was sufficient to protect them when extended all along the banks—then they had to increase all along the way.

Mr. Ostrom—Your estimation is, that this leveeing of the Sacramento or Bear, in the reclamation of these swamp and overflowed lands, is impracticable?

A.—Oh, no; not by any means, because there are levees on the Po forty feet in height.

Q.—Oh, if the land is valuable enough, you can do that on the Sacramento?

A.—May be not. You will have to levee the entire banks all along.

Q.—To levee the entire banks of all the rivers on the side affected by that debris, would it not be still more dangerous—if the harbor is in any danger at all, would it not still be more dangerous with these levees constructed—from the fact that it would have a main, sweeping channel, and sweep everything before it?

A.—Unless some system of irrigation were adopted, as is practiced on the Nile in Egypt. If they would adopt it, then a large amount of this sediment would be deposited on the low lands. The Nile brings down a very large amount of material—much more than the Sacramento—that is carried into the great valley of Egypt, and the fertility of the valley, or its continual fertility for the last six or eight thousand years, has been due to the fertilizing properties of the sediment deposited by the Nile in time of flood.

Now, as far as the navigation of the rivers have been affected. On the Feather River, the reservoirs which the miners have built in connection with the mines will already hold a very large amount of water. The most extensive of those reservoirs have been built within the last year or two, and some of those have not been built yet, will be completed probably this year. When those are completed, in about a year from this, their capacity will amount to about ten thousand million cubic feet of water. These are the reservoirs attached to the mines on the Yuba and the American. Now, these reservoirs will be drained off in about four months, during the summer time. Now, supposing a current of two feet a second, or one and one-half miles an hour, would give a body of five hundred feet in width by a foot in depth; that amount of water being discharged in the summer time will keep up the navigation of the Feather River. It will also have the effect that Colonel Mendell spoke of yesterday; it will have the effect of diminishing the danger from floods; because those reservoirs will be filled at times of great floods.

Q.—Ain't you aware of the fact that the navigation of those rivers has become impeded?

A.—I am not aware of that fact, because I am engaged in sending up freight, and never sent it as cheaply as last year, which was a very dry year, and the large part of our freight went by steamboat, and the rates of freight were lower, and no interruption in the traveling

—so far as I know the boats made their regular trips without interruption.

Q.—Was not the reduced rates caused by a strong opposition?

A.—I don't know what it was caused from. I have understood that in old times boats could not go up the Feather River at all during the dry season. Last year was a dry season, yet boats were running there the entire summer. I attribute that, as Colonel Mendell, to the water coming from the mines. I will say that several hundred thousand dollars has been expended last year on these reservoirs; when completed, the amount of water will be two or three times as much as last year, and that will result in making the Feather River navigable every season. I agree with Colonel Mendell as to the danger to the bar and the harbor if you diminish the amount of water which is running in and out of the Heads here. It will probably result in a shoaling of the bar. But that diminution will only result from filling up the bay between high and low tide. If you fill up the bay at low tide, it won't affect that at all, that is where the water is fifty feet or eighty feet deep—if you fill that up sixty feet, it won't effect the quantity of water going in and out of the Heads at all, because that water depends entirely on the action at high water. Much the larger portion of filling of the Sacramento and the San Joaquin is below low tide. Now, these reclamation schemes—they take in the ground which is covered by the tides—and I think that they have done more towards diminishing the tidal water than the stuff from the mines, because any one going up the bays here, as I go up them, can see that the deposit of this sediment has been below water. In Suisun Bay, at low water, you see some sticking out, but still the amount is not very much. If land were never reclaimed—left in its natural condition—high tide would flood it; it would be overflowed to a very considerable extent. This ground that we stand on here has all been built out; that has diminished the tidal area. I believe that the building of San Francisco alone has diminished the amount of tidal water more than the hydraulic mines.

Q.—This is an opinion based upon careful examination?

A.—It is simply from general observation. Harbors are very different things from what they used to be. Engineering has so increased and improved that you can make a harbor anywhere. The great objection to the Suez Canal was, that it was impracticable to make a harbor into the Mediterranean, the shifting sands preventing it; but they succeeded, and large ships, and more ships, go through this than any other place in the world. Engineers, if you give them money enough, can go right out to the Ocean-side House and build a harbor right there.

Mr. Ostrom—You speak of the amount of money invested, from San Francisco alone, in those hydraulic mines. How much do you think is invested in those mines in the interior—how much the whole investment would aggregate?

A.—Oh, I should think that the value of the mines is probably a hundred millions of dollars. I know that the mines that I am connected with—we won't sell them for less than four million, and I think they are worth five million.

Q.—Are you not connected with the very richest hydraulic mines in the State?

A.—No; I would not say that. I am connected with the largest, but not with the richest.

Q.—Have you any information in regard to the gross proceeds from the quartz mines?

A.—I prepared a statement two years ago, but have not prepared any statement this year. From the quartz mines, the production is, I think, a little over five million, but I won't be sure about that, as it is some time since I looked into that. Comparing quartz mines and gravel mines in Nevada County—Nevada County is the best quartz mining county in the State. I remember that two years ago the gravel mines were assessed for taxation, in Nevada County, I think, five or six times as much as the quartz mines. That will show you how much more important the gravel mining is throughout the State than quartz mines. They taxed our mines in Nevada County alone at nearly a million dollars.

Q.—Is not the improvements the mines?

A.—The largest portion of the tax is on the mines themselves.

Q.—You speak of the River Po filling about four or five feet in a vast number of years—about two hundred years?

A.—Yes, and also they have attempted—I don't know with what success—to do what Mr. Redding spoke of, that is, they have attempted to fill up some of the swamps near the mouth of the Po with the material which the river is carrying down. Whether this has been successful I don't know. To show what immense amount of material the Mississippi carries: From very careful measurements, made at its mouth, the river is carrying into the Gulf, every year, what would fill up a square mile about two hundred and eighty feet. But that is in addition to the soil and material which is deposited on the swamps of the Arkansas and Mississippi, so that the Mississippi really carries down a deposit probably twice, if not three times, as much as that. In spite of this immense amount of material, the navigation of the Mississippi is about the same.

Q.—Is it known what amount the bottom of the Mississippi raises?

A.—They think it has not raised considerably. Their observations extended over a short period of time comparatively. On the Po careful observations were made two hundred years ago, so they could make a comparison. General Humphreys and Colonel Abbott think that the bottom of the Mississippi is not changed very much. In old times on the Po—four or five hundred years ago—a large part of the water was carried across the low lands; now it is all on the levees; and the same can be done on the Sacramento.

Q.—Don't you think that the tendency is to fill up Suisun Bay? Don't you think that when this is filled up that the outlet of the water will be so diminished that it will fill up much more material upon us above—whereof Suisun Bay becomes nothing but a channel like the Sacramento River and the San Joaquin—the water not filling this area that it does now, will pour up on us?

A.—I don't think that it will, because its channel will be narrowed there. But I think that channel will keep its present level. I think the water being confined to a narrow channel will keep about the same level. I don't think it is going to pile the water up on the Sacramento and San Joaquin at all. Carquinez Straits don't fill. If the deposit in Suisun Bay goes on increasing, probably the channel through which the water finds its way will increase in depth. There will be channels to Suisun Bay, if it fills up. I don't know how deep, but there will be channels.

Mr. Byrne—What will be the length of time before Suisun Bay fills up?

A.—It will be a great many years.

Q.—Will it be during the life of hydraulic mining?

A.—I would not like to make an estimate. Suisun Bay is not a large body of water.

Mr. Ostrom—Have you an opinion in regard to solving this difficulty as it exists to a greater or less extent, and if you have, what is it? I would like to hear your opinion.

A.—Oh! the subject is of such great importance, and there are so many difficult questions involved, I would not like to say what plans could be devised to diminish this trouble. It seems that the State ought to appoint a commission, composed of engineers, to study it out; that is my idea of it. There are so few facts that no engineer could give an intelligent opinion upon it. He would have to make it his study, and go into the thing, to accomplish that purpose. You have got to have also careful and extensive surveys for engineers to arrive at any trustworthy results.

Q.—About how large a sum would be required to accomplish this result?

A.—There ought to be an appropriation of fifty thousand dollars to cover two years' work, and give you as the results such facts as will allow the Legislature, at the next session, to determine on something. Colonel Mendell and General Alexander have the same view. No good can be accomplished without a commission to go on and make elaborate and careful surveys. Something could be done with less than that; but if we are to make a survey, as it should be made, fifty thousand dollars is not too high a sum.

EXHIBIT "B."

Table showing amount of sediment carried by various rivers—sediment in solution.

Rivers.	Authority.	Water to Sediment.		Remarks.
		By Weight.	By Bulk.	
Mississippi, at Canalton	Humphreys & Abbott	1.449	2.753	For 12 months, 1852-3.
Mississippi, at Memphis	Lieutenant Marr	.596	1.132	For 3½ flood months, 1849.
Mississippi, average at mouth	Humphreys & Abbott	1.500	2.900	Assumed for long periods.
Rhone, at Arles	Gorsse & Suboun	7.000		At low water.
Rhone, at Arles	Gorsse & Suboun	.230		Maximum in floods.
Rhone, at Arles	Mean	2.000		
Po	Tadini		.300	Calculation by Lombardini Probably average.
Vistula	Spittel		.48	Extreme after ice floods.
Rhine, near mouth	Hartsoeker		.100	During floods.
Ganges	Everest	.510	1.021	For period of 12 months.
Nile, at Atfeh	Captain Spratt	.830		With current of 5 feet per second.
Danube, at delta	Captain Spratt, for Commission		2.400	Summer floods.
Nile	Estimate in Blackwell		.120	Maximum possible—vague
Missouri		.596	1.132	
Sacramento, at Sacramento	Dr. T. M. Logan	1.000	Say: 1.930	High water.

EXHIBIT "C."

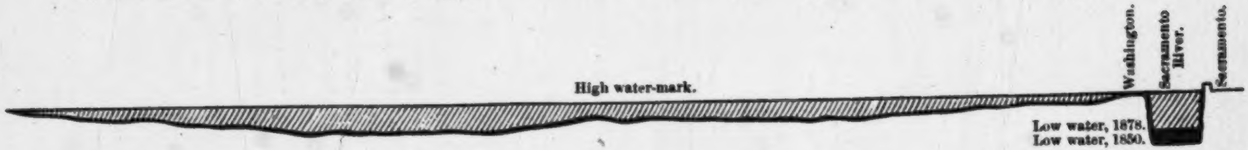
Capacity of various reservoirs attached to hydraulic mines on the Yuba and American.

South Yuba Company—not completed yet	1,900,000,000 cubic feet.
Milton Company	650,000,000 cubic feet.
Bloomfield Company	1,100,000,000 cubic feet.
Eureka Company	1,130,000,000 cubic feet.
Omega, Blue Tent, etc.—dams in process of construction	400,000,000 cubic feet.
Dutch Flat Companies	300,000,000 cubic feet.
California Water Company	360,000,000 cubic feet.
El Dorado Company—not yet completed	3,000,000,000 cubic feet.
Small reservoirs on both rivers, say	1,500,000,000 cubic feet.
Total	10,340,000,000 cubic feet.

Suppose this water to be drawn off in four months, say one hundred and twenty days, that would afford eighty-six million feet per diem, or one thousand feet per second. This, with a current of two feet per second, or over one and one-half miles per hour, would make a body of water five hundred feet in width by one foot in depth.

EXHIBIT A.

Section showing area of water passing Sacramento at times of extreme flood. (Rough approximation.)


Washington.
Sacramento River.
Sacramento.
High water-mark.
Low water, 1878.
Low water, 1850.

The heavy shading shows the diminution in the water channel in the Sacramento due to the deposit since 1850 in its bed. The light shading shows the water way now left. The current in Yolo County is, of course, very much less than the current in the river proper. The low water-mark was, in 1877, about three feet above low water-mark of 1850.

Sketch showing how the Sacramento River has filled.

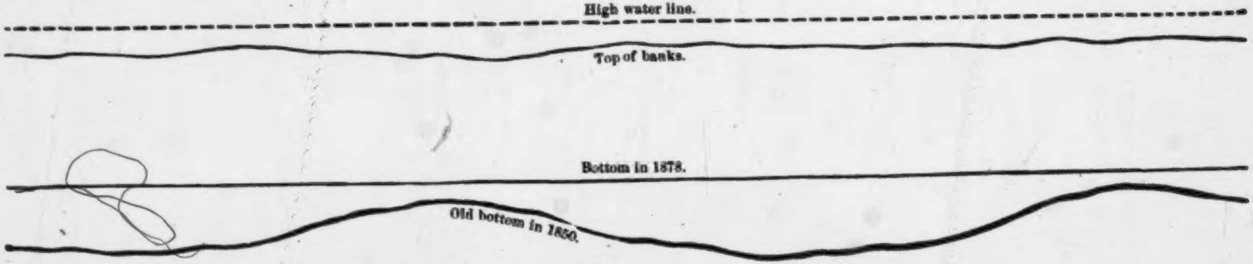

High water line.
Top of banks.
Bottom in 1878.
Old bottom in 1850.

EXHIBIT "D."

Population by last census.

Amador	9,582
Butte—two-fifths	4,562
Calaveras	8,895
El Dorado	10,309
Nevada	19,134
Placer	11,357
Plumas	4,489
Sierra	5,619
Tuolumne	8,150
Yuba—one-fourth	2,712
	84,809

Also portions of Trinity Klamath, Shasta, and Siskiyou.

Total population of State 560,247

EXHIBIT "E."

Production of precious metals in California.

1877	$18,174,716
1876	18,615,807
1875	17,700,000
1874	20,300,000
1873	18,000,000

OLIVER SMITH.

Mr. Ostrom—You are the Harbor-master at Oakland?

A.—Yes, sir. I am the agent of the Oakland Wharf. I can only give you information as to where I am. It is filling up somewhat in the slips. I have been there I think some seven years last August.

Q.—You say you notice that there is some filling?

A.—Yes, sir. The slip fills there with mud.

Q.—Where does that come from?

A.—We always had an idea that it came down from the river; we always supposed it did; we didn't know anywhere else it could come from. That is the general opinion there of all of us.

Q.—You are not familiar with the upper portions of the bay?

A.—No, sir.

Q—I understand from testimony we have heard that there is a current at high tide, a current setting around on the Oakland side?

A.—It does; it comes right across the wharf.

Q.—Have you ever noticed muddy water?

A.—Yes, sir; frequently. We see it most every high tide more or less.

Q.—Discolor the water materially?

A.—Some.

Q.—About how far out does that current extend—to any considerable extent?

A.—All that I have seen was right around the slip. All, I judge, over there by the dredging we have done there occasionally.

JAMES P. PIERCE.

Mr. Ostrom—You can proceed and make a statement.

Mr. Pierce—I have no particular statement to make. I will state that my business is mining and farming. I have large interests in agricultural lands and irrigation projects in Santa Clara County and Santa Cruz County. I have large farming interest in Yuba County, in the vicinity of the mines. I have some notes here on different matters connected with the questions asked others here. I will state that the amount of San Francisco capital invested in gravel properties in this State—I think the amount invested by persons living here is not less than fifty millions—more than fifty millions in San Francisco and the vicinity here. Some of the parties may live in Oakland—but right about the bay here. I will say that I have been engaged in mining for twenty-two years—made it a study. I think that the present value of the gravel mines and ditches, in this State, is from one hundred to one hundred and fifty million dollars. Three-fourths, or more than three-fourths, is owned in this city, or by parties living immediately in the vicinity. I am acquainted with most of the gravel miners and ditch men in this State, and I am confident that I am correct when I estimate that three-fourths are owned by parties living immediately around this bay. I will state that, in my judgment, the gold from the gravel mines in this State will increase, in the near future, to twenty million dollars per annum, and it will continue for a great many years.

Q.—Improve in value—the product?

A.—The product. The mines will increase. The yields last year were for thirteen millions.

Q.—And you think in another year they will increase to twenty millions?

A.—I think this year nearer twenty millions than thirteen, and in the near future, inside of three years, to twenty millions. I think the gold yield from this State, from the quartz and gravel mines, will equal twenty-five millions.

Q.—How do you arrive at this conclusion; from the increase of the past?

A.—I should judge from what I know of the mines, comparing the facilities for working and the condition that the mines are in now—partly owing to additional mines opened. In the next five years, better dirt work, better quality, bottom gravel. A great many mines have been stripped of this upper fine dirt, and many are prepared to work through deep bed-rock tunnels, many completed and will be completed—washing different class of dirt, richer than in the present case; the yield greater at no greater expense.

Q.—I would like to ask you, Mr. Pierce, how many thousand acres—you appear to have a very accurate knowledge of hydraulic mines—about how many thousand acres are there in this State owned as hydraulic mines, and claimed, that will pay to wash under the hydraulic process?

A.—I can't answer that. There are a great many thousand acres. There are a great many thousand acres claimed, but only a portion will be worked.

Q.—About how deep are the gravel banks extended, on an average—take the hydraulic mines throughout the State—about what average, say from the lowest to the highest number of feet?

A.—Well, they vary in different mines. I should think that an average wash of sixty feet would perhaps be the average of the different banks in the State.

Q.—Now, we will take the North Bloomfield Mine—how many acres have you in your claim in that mine?

A.—I am not interested in the North Bloomfield. I am interested in gravel mines in Smartsville and vicinity, and in El Dorado County.

Mr. Kercheval—How many acres is claimed as mining ground in those mines that you are interested in?

A.—At Smartsville?

Q.—The different mines that you are interested in? How many acres?

A.—I don't remember, sir. I can find out.

Q.—I would like to know about the depth that you expect to wash, also?

A.—I have the data. We have just had some surveys made at Smartsville. I have the data in town, and I could answer that question, but not here.

Q.—Well, couldn't you just approximate, as near as you can?

A.—Perhaps five hundred acres at Smartsville and vicinity.

Q.—What is the depth of that mine?

A.—I think that will average sixty feet. I may be mistaken in the area.

Mr. Byrne—Mr. Pierce, what proportion of the hydraulic mines that you know of—what proportion of the surface—has been washed off down to what they call the bottom strata or gravel? Say, take the mines at Smartsville, the mines about Dutch Flat, the other mines that you have visited and know of, and the mines of Nevada County?

A.—I should think from one-half to three-fourths, perhaps the latter. What they call stripping the upper layer—the soft dirt.

Q.—Now, what do you estimate the comparative value of the upper and the lower to be—how much richer is the lower found by experience to be than the upper?

A.—About four to one.

Q.—Then from the same quantity of earth washed in the future as in the past, four times as much gold would naturally be produced than has been in the past?

A.—No, sir. I don't think there will be four times as much gold produced.

Q.—How much do you think the comparative increase will be?

A.—I think it will be fifty per cent. more, because a certain portion of what is still left is upper lead.

Q.—Now, what is the difference in the character of material between the upper and the lower strata—if it is susceptible of being carried away by water, and carried to a distance?

A.—There is a very great difference.

Q.—Explain to the committee what that difference is, and why it is?

A.—Well, a great deal of the upper lead is comparatively fine material, fine gravel. The most of the dirt we are washing out at Smartsville now, three-fourths won't run a mile.

Q.—Why?

A.—Because it is so heavy—it is rock. Three-fourths of it is bowlders.

Mr. Kercheval—Well, do you think that you have got half of that stripped off of the whole five hundred acres?

A.—Oh, yes.

Q.—To what depth have you washed it—to what depth have you stripped it?

A.—I don't think we have half of the five hundred acres washed off.

Q.—To what depth have you stripped it?

A.—Some places one hundred feet, one hundred and fifty, and some places forty, thirty.

Mr. Byrne—Something was said about the capacity of the Yuba Cañon to hold gravel and this deposit washed from the mines, and the suggestion was made by the Chairman that if there was a dam across the mouth of the cañon its capacity for holding would certainly be very great. What would the effect of your washing at Smartsville, below the junction of the main and middle Yuba—what effect would your washing have there, by way of creating a dam or obstruction across the river?

A.—We dam up the river; the result is there is a regular grade for twenty miles above us, which keeps back the tailings above. We dump right into the river, and dam the river up—such heavy material that no flood moves it. Flood of eighteen hundred and sixty-two didn't move it. I think we fill in the river there one hundred feet. It is filled up, and keeps back the tailings above. We run bowlders through our flumes as large as—I don't know how much they would weigh, but as large as a barrel of flour, or a whisky barrel.

Q.—Mr. Pierce, does not that same result follow where hydraulic mines are carried on—in other words, is there not a series of dams?

A.—Certainly, sir. Whenever heavy material has filled in the river, it remains there.

Q.—What has been done by companies you are interested in, in reference to making a reservoir for tailings on the Yuba?

A.—Two years ago there was a levee built on the south side of the Yuba River, extending from Marysville eight miles back to the foothills, leaving a large section of country between that levee and the one on the north side of the river to hold the tailings coming down from the mines. It contains about thirty-six square miles.

Q.—How deep will that be filled with tailings before any considable portion of them will pass further down the river?

A.—That can be filled the depth of five feet without any injury to anything, and with a very small expense the levees can be raised higher.

Q.—Have you made any estimate as to how long it would take to fill up that reservoir, supposing the same quantity of dirt to come down that river as has been in the past few years?

A.—I am not an engineer, but we have an idea at Smartsville; my partners think it will hold the tailings for ten years. We had to put the money up to build this levee, and feel we are providing for ten years.

Q.—Then, as I understand you, after being filled the levees can be increased to hold the tailings for a longer period?

A.—Yes, sir.

Q.—You said something about utilizing the tailings and muddy water in agricultural pursuits. First state what has been done in Yuba County?

A.—Two years ago, extending our ditch down on to the red lands, between Smartsville and Marysville, we purchased a farm of one hundred and seventy acres; we are using this mud for irrigation on the lands.

Q.—With what result; what effect does that have?

A.—The lands that we purchased at five dollars an acre is paying one per cent. a month, or two hundred dollars net.

Q.—To what do you attribute the increase of the value of the land?

A.—To this muddy water. We cut three crops of alfalfa on the land, a year, where before we heard farmers would get an indifferent crop every year—some years not anything. I will state that I am interested in irrigation in El Dorado County. One-third of this muddy water will do more work than three times the quantity in El Dorado County, from the fact that it runs away and we can't confine it; this muddy water spreads all over the surface, and it wets the land and fertilizes at the same time.

Mr. Ostrom—Wouldn't it greatly increase even if it was clear water, without any dirt in it?

A.—Oh, yes; but the soil is rocky and porous, and I don't think that we could do anything with clear water. It is this red land, and I don t think we could do anything with the clear water. We use their water in El Dorado County, in a place called Greenwood Ravine; we are taking it up below there in a ditch, and extending it to a place called Negro Hill. If we ran muddy water to Negro Hill, we will get twice the price for it. One-third of the water will do just as much work—irrigate three acres to one.

(*Mr. Robinson*—This dirty water runs over the ground and forms a kind of cake that holds the moisture three times as much, as Mr. Pierce states.)

Mr. Pierce—I would like to state that the evidence given by Mr. Redding, and his views in relation to the utilizing of the sediment from the mines, to be very sound and entirely feasible. Being interested on both sides of the question, and visiting the mines about once in three weeks, I have seen both sides of the question, and being deeply interested in the welfare and prosperity of this State, as much so as any man can be—as all I have is here—I have endeavored in my mind to solve this question, which we are now trying to meet. I deem it one of the greatest importance; and I think, to a certain extent, his idea will solve the matter, and fill up these tule lands, which never can be reclaimed in any other way. If we can fill up the tule lands, and leave a wide course for the winter freshets to come down and make the reclamation not so great, and leave a passage here for the freshets, there will be a solution of this difficulty.

Mr. Kercheval—What proportion, do you think, of these tule lands can be reclaimed in that way, of the Sacramento and San Joaquin Valleys?

A.—I believe the larger portion can be reached. You will be surprised to see what a small grade this sediment would run on.

Q.—Would you cross those navigable streams?

A.—I believe it feasible to cross those navigable streams and run it on to the tule lands. I have no particular knowledge of its practicability, but I understand that pipes can be sunk under the river and this sediment can be carried across just as well as fresh water can.

Mr. Byrne—You stated that you owned land down at Santa Clara; do you have occasion to go down that way frequently?

A.—I go down three or four times a week. I live there.

Q.—Have you observed anything in regard to the filling in of the bay, along the southern shore of the bay, during the past few years?

A.—Yes.

Q.—State what you have observed?

A.—Being on both sides, my evidence ought to be considered impartial, and I will state, in my judgment, the shoaling of the bay is going on in a greater degree on the south and east side of the bay than on the north and upper portions of the bay. I have examined the Los Gatos Creek, particularly in the last month; it runs through the City of San José, and I am interested in Los Gatos and other places; and the amount of sediment running down the Los Gatos to-day and for the past month—I think more is passing through the City of San José to-day than is running under the bridge at Marysville; and they are raising the banks back between San José and Los Gatos, on account of the farming in the foothills—a thing that did not exist twenty years ago. I have asked a number of persons—and I expected to give this evidence, and I tried to post myself—and men who lived twenty years there, existed before farming, say the stream was clear, and no sediment, and now runs thick as it can run. So with Campbell's Creek, and the Napa Creek, and the Petaluma Creek. There is an immense amount of deposit being brought down the Petaluma Creek, so that at low tide you see the mud. At the Twelve-mile Farm—twelve miles from here, between here and San José—in the last twelve years they are building the same fence, the last piece of ground about them having been all filled up. There are gullies up there that you can put this building right in, on account of the farmers disturbing the surface, and so has been gullied and gullied all the time, and increasing. I will state that the place where the tide ebbed and flowed between here and San José twelve years ago, the cattle were grazing yesterday a quarter of a mile out from the track—a quarter—half a mile out! To give you an illustration how the bay has filled up: At my place, in sinking an artesian well, at seven hundred and twenty-five feet we found continuous layers, one different from the other. We found gravel, sand, clay, and stones—such layers all the way down—and at seven hundred and twenty-five feet, that right on a bed of clay and sand, where the sand and clay came from, we found an abundance of fish bones seven hundred and twenty-five feet under the surface—about six hundred and fifty feet under low tide at Alviso; so at that time, on my farm, the water must have been six hundred and fifty feet deep, and I am seven miles and a half from Alviso.

Mr. Byrne—To what do you attribute that?

A.—The washing from the mountains.

Q.—Do you know whether or not it is a fact that in all those artificial wells sunk in the Santa Clara Valley that fish bones and other evidence of marine growth have been found at great depths.

A.—Yes, sir. I think that whole Santa Clara Valley was formed by the washing from the mountains. The committee can form no idea of the damage being done to our bay just twelve miles from the city here. Something should be done.

Q.—What do you know about the navigation of the Feather River now, as compared with former times—say last year as compared with former years?

A.—We sent up our freight altogether from the river, for the reason it is cheaper and the trips are made regularly.

Q.—I suppose you are the largest shipper up that river?

A.—I don't know, sir, but we ship a great deal of freight up there.

Q.—Did you meet with any difficulty or delay in the transportation last year, any more than former years?

A.—Not so much. Better trips made now than eight years ago.

Q.—How do you explain that?

A.—There is more water in the river in the dry season than was ten or fifteen years ago, on account of being stored back by these reservoirs, erected for mining purposes.

Mr. Ostrom—Is not that thing, in great part, on account of building boats adapted to run in shoal water?

A.—Well, it doesn't matter. Should you build the boat it would not increase the water. I have no means of knowing, but there must be more water on the Hog's Back than was ten years ago.

Q.—Is it not a fact, Mr. Pierce, that the freight up and down Feather River is taken on barges—that they scarcely take anything at all on the steamboat?

A.—I can't say about that. We ship our goods, our freight, by the steamer Small, but whether they put it on a barge—the Small—I don't know. I would like to state that two years ago, I stopped three or four weeks at Sacramento, with Mr. Smith, here. We desired to have a State Commission appointed at that time. I feel still more anxious to have one appointed; and that this matter should be left to a commission composed of men who are in high standing, who have devoted their whole life to such subjects, and their tastes work that way. There is no use agreeing upon a small sum. Appoint men who will not steal a dollar of it; high-toned men—intelligent—who will not waste a dollar of it. I know that is what the miners desire. The miners' court investigation—court inquiry—we desire it. And if there is no commission appointed, it will be the fault of the farmers.

Mr. Ostrom—I wish to ask you a question. How deep do you find your gravel at the bottom—this extra paying strata that you speak of? About how thick do you find that?

A.—I think, as a rule, throughout the mines, the last twenty feet is much richer than the forty feet above it.

Mr. Hamilton Smith here arose and said:

The result of the washings at the Bloomfield Mine show that the bottom gravel was ten times richer than the upper gravel, and it required twice and a half as much water to move a cubic yard of lower gravel as the upper gravel.

Q.—About how many acres are there in the North Bloomfield Mine that are claimed?

A.—They claim some fifteen hundred acres, but of that there is only a portion which will be washed. It includes some land which is claimed for timber—a considerable tract. I suppose in that mine four or five hundred acres to be washed.

EGBERT JUDSON.

Mr. Byrne—What is your business?

A.—I am manufacturing acids, candles, powder.

Q.—Are you largely interested in manufacturing?

A.—Yes, sir. I manufacture candles, giant powder, and acids.

Q.—Now, what proportion of the articles that you manufacture do you find is consumed in mining operations, or in industries growing out of mining operations?

A.—Well, the most of the powder is used in mines, and a large amount of the candles are used in mines.

Q.—What of the acids?

A.—The acids are all used in manufacturing powder and the metals for mining.

Q.—Suppose hydraulic mining to be stopped in this State, to what extent would it decrease the manufacturing interests, so far as you are connected with it and have knowledge of it?

A.—Well, I should think the most in which I am connected it would take away.

Q.—Take away that altogether?

A.—Oh, there is a little used.

Q.—Now, will you state to the committee what proportion, in your judgment, and state, in that connection, what your means of observation have been, and what attention you have given the subject—what proportion of the sediment comes from mining, and what from agricultural and natural causes?

A.—That would be mere guess. I have been interested in the mines. I went into the mines in fifty. I went up in fifty in a whale boat, up to Sacramento, helped to row it. Wasn't much water, got out and pulled the boat with the rope over my shoulder. The steamer on the river was laid up, laid on a bar—the Governor Dana, I think. I knew the river since. I know there is large amounts of dirt coming from the mines, and a great deal coming from other quarters. I know in the bay—I have a ranch up here at Antioch, it is cutting a channel through my ranch—water from Mount Diablo; and, I think, the bay will fill up in time, from everything; I can't tell what proportion. I think the Sacramento and the San Joaquin has all been a lake. It will take a thousand years. There will be a river running through the channel; there will always be a channel, and I think the water is deeper. I know below Marysville there were cobble-stones in the bottom of the river in eighteen hundred and fifty, and I walked on them, and we could hardly get the boat up; that was a whale boat; and since that I know there has been more water running there, because I think it filled up with other stuff, and in low water cuts a channel there.

Q.—I suppose those shoal places that you speak of were bars?

A.—Yes, bars. There were deep holes and shoal places. Now these deep holes have been filled up. It has made a grade right down there clear to the bay.

Mr. Ostrom—About how deep was the channel at Marysville?

A.—At Marysville, deep. But the places below the mouth of the Yuba, that there was not deep at all.

Q.—I mean the banks—about how high the banks?

A.—I should think fifteen feet. I should think about that. When

I was there in August eighteen hundred and fifty, that was a very dry summer, and the water, I recollect, was pretty low.

Q.—Do you remember—were the rivers uniformly level on the bottom?

A.—No, I think there were deep places and shallow places.

Q.—Well, I understand that, but in the width of the stream—was it uniformly about the same depth one side as the other?

A.—I could not tell that. I know there were shallow places and deep holes in the river then; deep places and shallow places at that time.

Q.—Are you acquainted with the river lately?

A.—Yes, I have been up there often. Been up there in the last year.

Q.—About how much has the Yuba River filled up at Marysville?

A.—I should think the bottom of the river might have filled up twenty feet—may be fifteen, I could not tell exactly. I see the oak trees that look as if the dirt must be up ten or twelve feet. There is a large amount of dirt comes down from the mines. I have been interested at Cherokee, and we have had a good deal of trouble with the tailings running down, and we sued, and we had one suit that lasted three or four weeks, and we finally went to buy the land of these folks, and we bought of them twenty-six miles; and we found when we got down to the tules that was all right, but now we are in a worse state than before. Now they say we are filling up the tules, and that backs the water up the Sacramento five miles. They are complaining now, way down the tules, six miles below where our tailings goes in the tule lands, and the men up above say we have filled up the tules and the water is backing way up.

W. N. SHIRLEY.

Mr. Byrne—What is your business, Captain?

A.—Pilot.

Q.—How long have you been engaged in that business?

A.—I commenced in April, eighteen hundred and fifty-one.

Q.—Here in San Francisco Harbor?

A.—Yes, sir; since eighteen hundred and fifty-one. Been engaged in it ever since, with the exception of about nine months. I took one of the boats—one of the pilot boats—over to China.

Q.—In your capacity as a pilot, have you had occasion to know the condition of the bar at the outlet from the harbor?

A.—I have.

Q.—In eighteen hundred and fifty-one, and at the present time?

A.—Yes, sir.

Q.—Is there any difference in the depth of water on the bar now and then?

A.—Well, from my experience and observation I could not swear that there was; not an eighth of an inch. I have always been on the surface, of course, with the exception of heaving the lead.

Q.—You have had occasion to take soundings very frequently?

A.—Very often.

Q.—Then your opinion is, that there is as much water on the bar now as in eighteen hundred and fifty-one?

A.—From all I have been able to observe.

Q.—Well, your observations have been practical—throwing the lead?

A.—Yes, in bad weather. When I came here in forty-nine I came in charge of a vessel, and I think the bar was breaking as badly that time as when I ever saw it.

Q.—So your opinion is that there is no material change in the quantity of water?

A.—No, sir; I should say there would be some little change where there is a large river, but it is so slight in twenty-seven years that I have not been able to perceive it.

Q.—Then you are not of the opinion that the bar is likely to be so impeded so as to injure the harbor?

A.—Not for at least a thousand years.

Q.—Are you acqainted with the harbor above?

A.—Not much. My business has been at the Heads.

Q.—Have you ever seen or ever discovered any difference in the formation of the bar on the outside of the bar and the inside of the bar?

A.—Well, on the inside of the bar it appears to be different. In letting go an anchor I observed a hold on to the bar; it appears to be a quicksand. I have seen a ship part the chain. When you come to heave short, with a heavy surge on it, you part the chain. I have been under the impression it was a quicksand. The anchor, as soon as dropped on to the bottom, commenced going down. About two years ago I lost an anchor there in that way—an English ship.

Q.—Did you ever have a vessel to strike on the bar?

A.—No, sir.

Q.—What is the deepest draught you ever had?

A.—Twenty-six feet. I had one, the other day, drawing twenty-six feet. I think the vessels are larger now; in fact, I know they are—draw more water than in early times. Then twenty-two and a half, twenty-three, was the largest draught.

Q.—You think there is a sand formation on the inside of the bar?

A.—I consider it a quicksand, that is all.

Here a recess was taken to one thirty, P. M.

AFTERNOON SESSION.

Present—Messrs. Ostrom, Garver, and Kercheval; and Mr. Byrne.

PROFESSOR DAVIDSON, called as a witness.

Mr. Ostrom—You will proceed, Professor. You are acquainted with the subject that is before this committee. You will go on and give us your views in general, in regard to these questions, and in your own way.

Professor Davidson—I can answer you simply as to the manner of the formation of the bar of this harbor with which I have been acquainted twenty-seven and a-half, and with the deposit in the bay and on the bar, and, if you will let me consult the map there which I see before me, I will show you about the formation of the bar. I would premise by saying, on this coast, we have a general coast current coming down the coast from the north. We have also found an eddy current close in shore coming up the coast. Connect that eddy current, and we are giving the peculiar formation to all our bay and river entrances, so much so that at San Diego, and of all the bays coming up to the northward, the very formation of those entrances are sand, a sand formation. The northern points only are of a rocky formation; and even where a bar exists off the entrance of a bay or river—any river on the coast—the deposit of the bar or channel is hard there, that bar is to the north, and that, in spite of northwest winds, and in spite of waves that are coming down, and would naturally throw the waters along the south shore; but the waters are never thrown along the south shore unless there is some peculiarity in the formation of the land at that particular point. But, in almost every instance—the two cases that are not exactly so are Humboldt Bay and Shoalwater Bay—but all those south points, the entrances are sandy, and the bars are soft, away around to the north side. The channels get right up into the teeth of the northwest wind. So we have here San Francisco (pointing on map)—the inside of this is six fathom and less. We say that the bar of San Francisco has six fathom water. Now, that bar is not formed in the main, but in part may be—it is not formed in the main by the currents that come down from the bay, or the washing from the bay. It is mainly formed by the sand which comes along this shore line, and is carried to the north by this eddy current. You see the same at San Diego and Wellington. And General Alexander, as he became acquainted with that law, has utilized it at ——, in building up a bulkhead on the south side, from —— Island, and allowing the sand to pile up, and using it as part of his material. This sand comes up through here (pointing), and part of it, at the times between high and low water, becomes dry and is blown by the westerly winds over our city; but the part that is still wet and acted upon by the water, is carried this way, and it takes a turn here, but there is such a mass of water to come out that the greater depth and swiftness of the channel is carried close under Point Benito. Now, we made in eighteen hundred and fifty-three, or thereabouts, a survey of the entrance and projections of San Francisco Bay, and when I, in seventy-two or seventy-three, had charge of the government works on this coast, I had a re-survey of the bar and bay made, for the purpose of studying the question of the shoaling of the bar or any other part of the Bay of San Francisco. The work in the first survey was all simply for the benefit of navigation, and not of the physical questions. It is enough for the navigator to know within a foot of what water he has, and the first surveys were made by the hydrographers giving the depths to the nearest quarter fathom, always with the advantage to the navigator—that is, if there were five fathom, five feet, it was not called five-fathom, it was called five, four and one-half; averaged five feet four. It was not called five four quarters, five and one-half; so sometimes you might have nearly a foot more water than the soundings gave, and in order to have a good basis for future work I had the soundings made to the nearest foot. So in the course of twenty or thirty years we would be able by a measurement to detect any change. But from eighteen hundred and fifty-two to eighteen hundred and seventy-two or three, say twenty years, there has been no perceptible shoaling on the bar of San Francisco; neither on the bar proper, which I call the six-fathom bar, or in the Benito channel. If there were shoaling we would be able to detect it by the width of the bar increasing; it has not increased. So if you were to put a tracing of my survey in eighteen hundred and seventy-three—that is, made under my direction—upon the old survey of eighteen hundred and fifty-three, my survey will show that I have more details in it, but will show no shoaling. And, in proof that there is very little change going on on the bar of San Francisco, in one or two places the lead brought up a species of what is known as the achinus or sea urchins, where whole patches exist on the bar. Now, if the bar were taking a deposit, two or three inches would kill them all. That thing is a proof of the slight change, if such a change is. The natural tendency, however, is for the bar to decrease, and that tendency arises from several reasons. One of the first natural causes for the first decrease of the bar is the material brought into the bay and then carried in part to the bar, from the washings of the land, first, before the land is cultivated. Then when you cultivate your land, remove your grass, put in crops, plow it so that you expose it to the action of the rain, an immense amount of very fine material is carried into the bay. Naturally, it will be deepest in the shoal parts of the bay. As, for instance, in the shoaler parts, if we were coming down from Petaluma, it would deposit in the shoal parts before it would show anything at all in the channel way. A part of it that gets in the channel way would be worked in by the current at comparatively a slow rate, because as it would advance by ebb it would be carried back by flood, and gradually would find its way to the bar and be deposited by this eddy current to the north. Some time in the winter of fifty I was keeping a station on Point Reyes Hill, and the yellow waters, the waters carrying a great deal of material in suspension from the Sacramento River, were carried away near Point Reyes, just twenty-seven miles from the Heads, and I could see the line from my station. Each successive ebb tide brought out a new quantity of material. Now, in the natural condition of things, when the country was covered with grass, a small amount would be brought down. After plowing up, you bring down an immense amount of material, and of the lightest character, so that it would find its way over to the shoals. There is another source—wherever you fill up and lessen the tidal prism of the waters of the bay, that is, the sheet of water or the prism of water which is measured between high and low waters. If you decrease that sheet of water, so that there is less scouring on the bar. Suppose you shut off the half of San Francisco Bay, and the waters only of the lower part of San Francisco Bay pass through the Golden Gate out here. This material that is brought by the eddy current, a part of the material that is brought out here, would gradually go over to Point Benito and check the deep vessels. I don't say how much; that is a difficult question to answer. I doubt whether any engineer is confident without experience. In a minor degree, every acre of the four hundred square miles that is in the two bays—every one of those acres or square miles that is covered, so that the tidal prism is lessened—will have the tendency to lessen the depth of water in the Bay of San Francisco.

Then comes the amount of mining debris brought down from the mines. I have been to some of the mines; in eighteen hundred and seventy-three went with General Alexander and others. I was one of a United States Commission. We examined the Yuba and some other streams—what filling had been done; but as to the damage they were doing upon the land immediately after leaving the hills, I can't answer, because I did not make a special examination. But judging of the discolored water and character of the material deposited, I should say it formed but a small part of the material which reaches the waters of the bay, compared with the material brought down from the cultivated lands. And in a recent survey—comparatively recent—two recent surveys, one in eighteen hundred and fifty-six and then this, to settle the question as to whether there was gradual shoaling, there was then a gradual shoaling in this region in the channel. How much mining was done in that time I can't answer, because that has not been my special line of thought. I have no doubt in my mind that the particular part shoaled was really the effect of the material brought down from the cultivated lands. And the proof of my position, that this detritus has not reached the bar of San Francisco, is in the material of the bar itself. You take up the material and compare it with what is blown up here on the sand dumps—it is almost identical. The whole question comes into your filling your bay, thereby filling up your tidal prism, as is done here; because you see that all this low land in San Francisco Bay was formed before we ever came to the country, and so all that debris brought down from the land to-day on account of cultivation is being formed more rapidly than in former years, but it may take a long while to prove its effect upon the bar. Its effect upon the Harbor of San Francisco will be comparatively small for many years; the damage will be to the bar of San Francisco. Now if you wish to ask me any questions in detail.

Mr. Ostrom—You speak of the water of the Yuba—did you make any examination with the view of determining the portion of earth matter held in suspension?

A.—No, sir; we were then on work of irrigation.

Q.—Did you ever notice the Sacramento River or the banks?

A.—I have seen it in flood and when it ran clear water.

Q.—That was in former years?

A.—And as late as seventy-three. We have followed the Sacramento up as far as Redding and still higher. Above the forks of Feather River it is always clear. Those local questions relating to the deposits I am unable to answer.

Q.—Did you notice the Sacramento River below the forks of Feather River; and if so, what comparison had it to the waters of the Yuba River, at the time you saw it?

A.—I have not made any examination that would enable me to give a good opinion. My work has been particularly with reference to the bay, and its soundings, and depths.

Q.—More in regard to the quantity of water than the quality?

A.—Of course. Of course the quality does come into our work in the bay, when it reaches it, because then we have to consider the question of deposit and where deposition will take place. If we see a wharf going out from Oakland Point to Goat Island, we know a deposit is going to take place, and the question is afterwards to see if that deposit has taken place and what it is; so in that manner do we become acquainted with the character of the material in the bay.

Q.—You have not examined that question of the effect upon the beds of the rivers or the land itself? Would you not be able to give an opinion?

A.—I cannot.

Q.—I want to ask you a question. The channel of the Sacramento has filled up no doubt very much. I presume there comes a large quantity from the hydraulic mines?

A.—No doubt it plays a part, but at the same time the cultivation of the land, also, is playing a large part in the matter.

Q.—Well, perhaps up in that country it has a great deal less to do with it. It is very flat.

A.—That is true. But recollect you never see clear water running off cultivated land into the streams. And take the streams of the Eastern States, such as the Schuylkill and Delaware. The cultivation of the land has led to a large increase of the material in suspension in the water.

Q.—In any of the streams you are acquainted with—the beds of the streams—have you ever known any of them to fill up? The effect of the cultivation?

A.—I have known of large deposits made in the Delaware, from the material brought down from the lands. I was employed by the Government to make examinations for the foundations of a proposed League Island Navy Yard, to ascertain if it were possible to get stable foundations, and in sinking in one case to the depth of sixty-four or eight feet, I found layers, layers like the layers of paper, of fine sand, fine mud, all through there, showing that material had been brought down and was deposited on the gravel bottom of the river at that point, and had formed there thirty and forty feet thick. And the same deposits take place wherever obstructions are, as in the Columbia River; there the deposits coming down the river from the soil having formed a shoal around there, with very little water upon it now.

Q.—This stream that you speak of, I know from the fact that it was so very long ago that this deposit has occurred, the bank itself has raised from natural causes and left as deep a channel as the stream originally had—the Delaware?

A.—I think not, because the gravel in the river was the same depth as under the island. My soundings on the river touched gravel in most places that my well apparatus touched the bottom at the island. But in Columbia River the same deposit is going on all the time, the channels closing up so much that the Cordell (?) channel, just eastward of —— Point, is not used at all by the pilots.

Q.—That is outside?

A.—Yes, more or less inside the mouth of the river.

Q.—Do you think that a stream of the size of Feather River—do you think that a stream of that size would naturally fill up from the natural action of the water? I think it is about thirty-five or forty miles from the forks to the foothills—there is that distance of land cultivated on the side. Do you think that that amount of cultivated land, or the debris that would flow from it, would be likely to fill up that channel in any length of time?

A.—It would be a comparatively long process. The material in suspension coming from cultivated lands is of course the lightest material, and that would be carried further down into other rivers, and Suisun Bay, and such places.

Q.—Do you not believe, Professor, that it would be perhaps a matter of probability for this light detritus from agricultural lands so filling up a stream like the Sacramento River, so that perhaps in the course of the near future that the channel itself would be obliterated?

A.—The channel itself must fill in from natural causes, because we all know that near Colusa the banks of the Sacramento itself are twenty feet higher than the land to the western part, and in all these great streams, the Mississippi, Amazon, all streams running through a flat country, the channel bed is raising, and those rivers are all running on a ridge; therefore you have a process going on—the natural detritus going on; you increase that action by mining or cultivation; it is clear to experiment how soon it will fill up.

Q.—Does not that show that the bank does raise, and that, if the bottom raises also, they keep on a level?

A.—The natural tendency is, there shall be the same depth of channel way; and where the water comes down too rapidly for the new grade, then it will break the banks in the form of sloughs, and then in the low troughs on each side.

Mr. Ostrom—In California, in flood-times is the only time, if any, that agricultural lands will drain off any of this detritus spoken of. We all know, as you say, that our streams run on a crest; that when they get full, they overflow and run back. Don't you think that, in the place of bringing this deposit into the channel, it would rather throw it away from the channel?

A.—But there breaks through, of course. But if you keep your waters in the channel bed, and simply allow them to flow over the edges, then you have a new deposit every year, as you have, and must have, in the Sacramento River, as to have raised up a ridge twenty feet above the other.

Q.—I have always thought that the channels of our streams remained about the same depth?

A.—I think so myself, sir.

Q.—I cannot help but think that, in all our streams, that the bank of the stream, whether streams run on a crest or on a ridge, in the valleys, so that when they do overflow, in place of drawing in this light detritus, it would throw it away from it, and run back into the swamp land districts, where it would settle?

A.—That is naturally where it would be deposited, as you see in every little slough. Particularly I notice on the San Joaquin, to be full of little banks, so to speak.

Q.—Yes, that is why I can't understand how you can reconcile the two theories, or the two ideas, that the cultivation of the land should bring and throw this detritus into the channel, and consequently bringing it down into the bay, when, from the nature of things, it should throw it away and out of the channel.

A.—That is true, but you have certain streams coming down through lands that are not on this level plain, and when these come down they bring this material from the ploughed lands.

Q.—The San Joaquin, and others, come down from the hills and spread their material?

A.—The San Joaquin is not an exception to other streams, so far as I have noticed it. Its banks are high, and yet the water that runs off the soil, off cultivated land, must go into the streams.

Q.—But in the upper portion of this State, all, to use a general term, and there is but a very slight exception, all the cultivated land is very nearly level, and there can be no drainage.

A.—It is difficult, without observation, to pass an opinion upon that. I am only speaking of such cases as at Colusa, where the water of the river must go out, and carries its detritus into your low country. But there is a certain amount of cultivated land along the edge of the river that always has its outlet into the river—into the smaller river, and they would convey it to the large one, and it brings it down.

Q.—That looks very reasonable, all but this one thing: when we take into consideration the fact, in California there is no drainage from agricultural lands except in wet times, and those wet times the streams are full?

A.—I was not speaking of holding these small streams; on the contrary, the larger ones overflow their banks and come into this low country. I reconcile it on the broad grounds that all that water does get into the main streams before it gets into our bay. And take the Willamette River, I have found in September, during that rainy weather, when everything was running in flood, it ran into the Willamette and carries an immense amount of detritus. Just before the flood it was as clear as any; after the rains it came in heavily laden with suspension.

Q.—Can you not reconcile this fact; it was all a rolling country?

A.—The country where I have selected, the land for thirty miles is as flat as a pancake. The upper part is like a billiard table, down the low part it is rolling country—a rolling land interspersed with flat land.

Q.—Our land up there, it is flat; the whole agricultural portion, every particle, is very flat. In the next place, it is all clay formation, except Pure Creek and Cash Creek drainage—all above that is a plain.

A.—That is true, as far as the upper part of the river is concerned; but, nevertheless, every particle of water that does come into the Sacramento from cultivated land brings its amount of detritus. I believe all gradually get into the bay. The whole of Suisun Bay—all its shoals have been made from the detritus brought down from the upper country.

Q.—You have not made any observations in regard to this matter?

A.—Never made any experiments to determine the amount in suspension or what its character was.

Mr. Byrne—Professor, are you familiar with the extent of these schemes of reclamation that are going on about the mouth of the San Joaquin?

A.—No, sir; only in a general way. I notice the lands are being largely taken up.

Q.—You have a general knowledge?

A.—General knowledge of the lands being leveed.

Q.—What effect the leveeing these large bodies of land and their reclamation has upon this tidal area or prism?

A.—It is like throttling a harbor, so that a large amount is held back, as it were, in a special reservoir, and deposition will take place more rapidly than it would if there were the usual strong current.

Q.—Now what comparative injury would you say is done by the reclamation that you speak of and by the deposit of sediment from the mountains?

A.—That I am not able to say, and I think it cannot be fairly answered without experiment.

Q.—And the more you reduce the tidal area the more danger to the harbor?

A.—Yes, sir. And if you throttle any harbor, check it—large or small—you have that same tendency. If, for instance, you were to throttle the entrance to Napa Creek, throttle it one-half of the ground it has been formerly, in time it would shoal very rapidly in there, and the material brought down by cultivation down there into the straits would form a large deposit much more rapidly than it would if no throttling took place.

Q.—What effect would the decrease of the area have upon the entrance to the harbor?

A.—If the material is not brought down to the entrance of the harbor to decrease the tidal prism, you will have no decrease of the depth of water on your bar.

Q.—But, supposing that there is a large extent of land over which the tide formerly ebbed and flowed—and the tide is excluded from that land, by leveling—what effect does that have upon the entrance to the harbor?

A.—If it is part of the tidal prism, the whole tendency is to shoal the water at the entrance to the harbor.

Q.—Now, is there not a greater tendency to shoal the water by this means than the debris that would flow down the river?

A.—I think so, but am not sure, without experiment.

Mr. Kercheval—I want to know if Professor Davidson knows what depth of water flows over these islands (Sherman Island and the vicinity)—whether it would flow over them and fill them at all?

A.—I can't answer.

Mr. Kercheval—I want it understood, as it is being claimed that the reclamation of these lands has shut off the flow of the tides, and caused the filling of the bays; and if it is claimed and still insisted on that this is the case, I shall claim and insist on an investigation of those that live upon the islands, to show that it does not flow over them sufficient to make any difference with the coast tide going in and out, because it is simply aimed towards our reclamation there.

Mr. Ostrom—(to Professor Davidson)—You are acquainted with the amount of water that runs down the Yuba River?

A.—Well, I can't tell you at different seasons. I saw it in July, eighteen hundred and seventy-three.

Q.—You saw it in its lowest stage?

A.—Yes. Flood-times the Yuba River is an enormous stream of water.

Q.—How long would it take a stream the size of the Yuba River—from the natural inflow of this debris from the mountains—part of it where there is no cultivated land to any extent at all—how long would it take that to fill a valley fourteen miles long and four miles wide, the channel five feet deep?

A.—From the natural flow?

Q.—Yes, sir.

A.—Of course, I could not give you any figures. I should only say it would be a very long period; that it is a matter where you want to know the amount of suspension a cubic foot, and then you get at the result. I see just below Smartsville, or at Smartsville, I see the amount that was filled in in the Yuba, which they said by old marks on the sides of the ravine was seventy-five feet above the old bed. But of my own knowledge, I know not.

Mr. Garver—Is it hurting the rivers and bays here?

A.—It has that tendency. It would be a difficult question to say how much so. On the bar we see no change whatever in twenty-eight years. No gentleman will deny but what it is the mining debris that is filling those streams.

Q.—I believe they acknowledge that. But don't you think that in the additional grade that those streams are receiving by filling so enormously at the head, that it would naturally push this stuff down into the bay?

A.—It has that tendency; how much, it would be a very difficult problem to answer. At each year, as the drainage is increased, not only would the light amount be brought down, but the tendency to bring down something heavier with the increased grade.

Mr. Kercheval—Do you think, from what you saw on the Yuba and Feather Rivers, from what examination you have made, that the washing of the agricultural lands caused by the cultivation would have filled up those streams to the extent that they are filled up now, in the last twenty-eight years, since the country has been settled up there—been under hydraulic mining?

A.—No, I am satisfied that the whole of the filling near Smartsville has been done by the hydraulic mines.

Q.—Take it at Marysville?

A.—I have not made an examination there.

Mr. Byrne—What effect, in your judgment, will the building of these levees and the reclamation of these islands at the mouth of the San Joaquin and Sacramento, and the confining of the water within narrow channels there, have upon the country above that and upon the cities of Sacramento and Stockton in the event of a great flood?

A.—All this leveeing has a tendency to throttle the channel, and possibly before the channel would be scoured out deep enough to allow the flood-waters to pass away—in other words, there will be more flood up there with the throttling than without it.

Q.—Now, sir, have you thought of any solution of this difficulty, or any method or devise by which the interests of miners and farmers alike may be protected, and some remedy found for this evil?

A.—My study has been such as to convince me that the whole problem is a difficult one indeed, and that it cannot be done except by one or more men who give their whole time to a thorough investigation of that part of the Sacramento Valley—I mean not only the river but all the tributaries running into the river.

Q.—What would you suggest or advise in that connection?

A.—I should suggest a commission. I have been on several commissions; and although I know there is a popular feeling against commissions, I believe, if it is a good commission, that you get the best results; because, three men could share their views and arrive at a better solution than any one man, unless a genius, can possibly give. You have asked me whether I have given any study to the subject. Just recently I read a paper before the Academy of Science, urging that we want in this State a physical survey of the whole State, and especially referring to the questions of irrigation and reclamation; so the question is not new to me, but a difficult question to handle unless a person gives his whole time to it.

Mr. Byrne—Professor, you have had some experience, as you have already stated, upon commissions, and know something about the probable expense attendant upon a work of this kind. Would you be kind enough to give the committee an idea of what, in your judgment, would be an adequate appropriation from the Legislature to carry out this work properly; to cause a proper examination to be made, proper report to be printed, and such other information as should properly be laid before the next Legislature?

A.—I could give you a statement in writing hereafter; I would not like to make a statement just now. I want to base it upon what other commissions have cost, and I would make a statement in which the State itself should pay expenses. In other commissions the government has assisted persons, but we have not time for those things here, for one commission has had to go on a year. In that case the State got our services for nothing, but only at irregular periods. Therefore I would make a statement of what to give these men who devote their whole time, and not periodically engaged upon it.

Mr. Kercheval—Professor, how soon could you submit such a statement so that we could have it? On account of the Committee on Ways and Means going to make appropriations, how soon could you furnish such a statement?

A.—Furnish it in a very few days. It would be the biggest advertisement abroad that you could have, to get up a physical survey of this country—an advertisement in Europe and the Eastern States that you could not get by any other way.

Mr. Ostrom—Professor, here is a question I would like to ask you: There are many of the people of Colusa County, leading men up there, that are now contending that the filling up of the Sacramento River, at the junction with the Feather River, has caused immense amount of overflow on the Sacramento River above; that this filling up below decreases the carrying capacity of the channel, and has, as you have well stated it, I think, here—it has dammed the water back so that it would flood with really less water than it used to carry within its banks, flood the whole entire country above for a short distance and upon both sides. Do you think that that would cause such a flood as they have been having?

A.—I have no doubt that part of that flood is from that very cause; part throttling the stream and filling up the channel there. There may be the same depth of water, but say you fill the bottom up three feet; you have changed the grade, and as I told you your steep grade will bring down more material and pass your water more rapidly. In this case it brings down the material and then it does not flow away so fast.

This concluded the evidence, and at three o'clock and thirty minutes P. M, the committee adjourned to Sacramento.

MARYSVILLE, February 16th, 1878.

The House Committee on Mining Debris met in Marysville at the City Hall, and proceeded to take testimony.

Present—Messrs. Ostrom, Coffey, Kercheval, and Garver.

The Chairman called the meeting to order, and after stating the objects of the examination to those present, called to the witness stand

W. H. DRUM

Who, being duly sworn, testified in substance as follows:

I have an interest in these matters in the way of farming. I have been farming here for twenty-seven years on the Yuba; I settled there in eighteen hundred and fifty-one, six miles from Marysville—east of Marysville.

Mr. Coffey—State your ocupation, and go on and state all you know about these matters.

A.—Well, my occupation is that of a farmer; I settled there in eighteen hundred and fifty-one, or at least bought lands there in eighteen hundred and fifty-one, on the Yuba. I farmed eight hundred and eighty acres of bottom land, and I have remained there ever since until the last few months. Those lands were grant lands, and not public lands. When I first settled there, we had banks on the Yuba River that were fully twenty-five feet high in low water. As to this filling of the rivers, it has been done within the past fifteen years. Not over fifteen years since the first filling of the river bed. I never noticed any perceptible filling previous to the commencement of hydraulic mining.

Mr. Ostrom—Since that time about how fast have the river and bottom lands filled up—about what proportion from year to year?

A.—Well, more in the last ten years than during all the former times. It has been filling more the last ten years; and during the past two years, it has filled more, perhaps, than during the ten preceding years. On one place, on what is called the second bottom, it has filled up five feet over thirty acres during the past two years.

Mr. Ostrom—You say it has filled more in the last two years than during the preceding ten years?

A.—Yes; but you might say during the last four years, because there was considerable filling in eighteen hundred and sixty-two; that filling did not harm our lands much. It afterwards became so that we could cultivate again, and the lands were as good after that as before. But from that the filling has been going on year after year, until the last four years, and from that on it has been going on a great deal faster. In the last two years, as I said, these "second bottoms," where there was never any water in the highest freshets until three years ago—in eighteen hundred and sixty-two, there was water there, but it didn't fill any—but that same land now in the last two years has filled five feet. It has filled up that much generally all over the level, clear across. My main land I have not attempted to farm for several years.

Q.—About how much, in your judgment, would that class of land be worth at this time.

A.—Well, the tract of land I had was worth there, before it was filled any, two hundred thousand dollars; there was over eight hundred acres, worth from one hundred and seventy-five thousand dollars to two hundred thousand dollars. I have that from other land proprietors, who are more competent to judge than myself.

Q.—What was the quality of the lands?

A.—They were all alluvial lands, bottom lands, the finest to be found anywhere.

Q.—Before this filling took place was it usual for these lands to be injured by high water?

A.—No, sir, not at all. When I purchased there the banks were twenty-five feet high.

Q.—Now, Mr. Drum, I will ask you what, if any, relief can be obtained from this filling; is there any remedy?

A.—No, sir. Not for this land now. I don't think they can be reclaimed. The main bottom is from five to fifteen feet deep, with sand and sediment. My main bottom lands are covered eight to fifteen feet deep with this stuff.

Q.—Have you no idea that there could be any remedy; have you never thought of any way of alleviating this difficulty?

A.—Well, there can be but one remedy, in my opinion, and that is to stop the debris from coming; there is no other way that I can conceive of for remedying the evil. If it would stop coming, perhaps I could reclaim a small portion of my land in time.

Mr. Coffey—I understand you, a great deal of this land is irreclaimable?

A.—Yes, sir; a large portion. We could perhaps reclaim a portion eventually, provided the debris was stopped.

Mr. Ostrom—About how deep is it filled on the Yuba River, the old channel, at this place?

A.—As near as I can calculate, from landmarks and from the timber, about twenty-eight feet; from twenty-five to twenty-eight feet. It will average over the bottom lands from eight to fifteen feet. A portion of it is filled at least thirty-five feet. I get these figures from the fact that on the main surface, where the telegraph line runs, when I was over there, I found there was but from four to six feet of the tops of the poles left sticking out. The length of the poles, I believe, is from twenty to twenty-five feet. There has been that much filled over the main surface. They had about twenty-five feet banks on the river at that point before the river began to fill.

Mr. Ostrom—You have been there continuously all these years. I will ask you if there was any way ever suggested itself to your mind whereby these tailings could be run in any other channel, and if so, how can it be done?

A.—None that I know of. They will find their way down. The coarser ones will lodge, while the finer sediment will be carried farther down. Five miles above my place there is a great deal of coarse gravel. When you get down here there is very little gravel. Sometimes you find gravel a little larger than a hen's egg. A great deal of the coarser material is deposited near the mines, and the finer material runs down.

Q.—About how far is it from where you live—the place you speak of—up to the upper end of the valley lands?

A.—About four miles; that is, about four miles to the end of the cultivated lands. Above that there is very little land cultivated.

Q.—Has it filled more, or less?

A.—More. Up about Long Bar it has filled fifty-five or sixty feet, I suppose.

Q.—It naturally flows with a great deal stronger current at this time?

A.—Yes, sir.

Mr. Kercheval—What is the character of this debris on your land? Is it of such a character that if the water could be kept off it would be productive?

A.—If the water could be kept off it could be brought into cultivation and would make valuable land, that is, a portion of it.

Mr. Coffey—Is this debris, which covers your land, a good fertilizing material?

A.—Sand is better than the debris as a fertilizer. Sand will turn back into soil, but the debris poisons the land with alkali.

Q.—How long is it since this debris began to make its appearance perceptible to the detriment of the land?

A.—Well, in eighteen hundred and sixty-two; about fifteen years; there was more sand came then and very little of this fine stuff.

Q.—Has this all filled since that time?

A.—The first five years after eighteen hundred and sixty-two they had no trouble. In eighteen hundred and sixty-seven they got considerable of it. From that time until the last four years it has been coming gradually, taking our lands by the strip each year, and since that it has been a great deal worse.

Q.—What portion of your land has been rendered worthless?

A.—The whole of it; it has destroyed every acre of it.

Mr. Ostrom—About how much, if any, of this debris came into the rivers prior to eighteen hundred and sixty-two.

A.—Not any to my knowledge. The rivers were high, but there was no deposits at my place. Previous to eighteen hundred and sixty-two we never had any filling from overflow.

Q.—You are acquainted with the valley generally—have been since?

A.—Yes, sir.

Q.—I will state to the witness that the idea was advanced before this committee in San Francisco that the tules could be filled up with this debris. What is your opinion as to the value of it if it was filled up with debris?

A.—Well, in the first place I believe it could be done, but it would be at a very heavy expense. My opinion is this: They could not get fall sufficient to keep any channel open, except for the finer portions of them. They would fill up because of their not having sufficient fall; but if the canal was kept open the finer portions of the tailings would reach the tules, I suppose. You go down to Sacramento and you find some of it there. It is the same on the other rivers—on the Feather River it is filling it in. I know this because I have marks set, and I find the same water stands four feet higher than it did two years ago.

Q.—You are an old resident of California. I will say that there is a project on foot to cut a canal from the Sacramento River, near Knight's Landing, and carry part of the water across the tules to Suisun Bay. I want to ask you one question as to that: Do you believe that would be of any benefit, or draw any portion of the debris from this country?

A.—I don't, for the reason that the debris don't run up stream. I don't think any portion of the debris can be drawn off in that direction.

Q.—About how much land has been destroyed there from the mouth of the Yuba River, take the whole of it, up to the foothills; about how many acres of land?

A.—I should estimate it in the neighborhood of twelve thousand acres.

Mr. Dibble—What is the distance from the junction of the Yuba River with the Feather, up to the upper point on the Yuba, where there has been any destruction of land whatever?

A.—About fifteen miles, I judge.

Q.—To what point above do you refer?

A.—I refer to Long Bar, at the upper end.

Q.—What was the character of the land five miles below that point?

A.—It was good.

Q.—To what extent was it good?

A.—Well, it was a bottom spread out about three miles below Long Bar, and the land was very good.

Q.—What do you estimate the width to be, running down to the junction of the Feather and the Yuba—the average width?

A.—About two miles and a half—from that to three miles.

Q.—Are there not a good many points where it is not half a mile wide?

A.—No, sir; there is no point there where it is not a mile and a half wide.

Q.—What time did you obtain possession of your land?

A.—In the beginning of eighteen hundred and fifty-two—I purchased the land in eighteen hundred and fifty-one, and took possession of it in January, eighteen hundred and fifty-two.

Q.—What time did you obtain a patent to your land?

A.—It was grant land. I did not obtain a patent from the United States.

Q.—Now, you say, on the average, running from the junction up to Long Bar, it is fifteen miles, and two and a half to three miles wide?

A.—Yes, sir; that would take the extreme width. It is one and a half to three miles wide.

Q.—Where is the widest point?

A.—Right about my place, six miles east of here. I think it is section sixteen; I don't know. The land I occupy is not three miles wide, because it is on the north side of the river, and the other is on the south side of the river, opposite me.

Q.—On the south side of the river isn't the land rising and stony?

A.—Yes, sir, when you get higher up.

Q.—How far from the old bed of the river is that?

A.—About two miles below Long Bar.

Q.—Take the thread of the river, how far was it from the centre of the river where it was gravel and stone?

A.—Well, it was half a mile to a mile and a half on the south side.

Q.—How high was the bank in eighteen hundred and sixty-two, on the south side of the river, before any filling in took place?

A.—Somewhere in the neighborhood of twenty-five feet—between twenty and twenty-five feet.

Q.—Isn't it a fact that these banks were stony and rocky, and hardly fit for agricultural purposes?

A.—No, sir; it was as fine land as I ever knew anywhere.

Q.—How much have the banks on the south side of the stream—the banks being twenty-five feet high—how much have they been filled up; how far above its banks?

A.—I don't know how far it extends back, but the tailings on the south side are from twelve to fifteen feet deep.

Q.—You say the bank on the south side was twenty-five feet high. Now, you say the tailings have been taken down the river. Now, I ask you how much on top of that twenty-five feet bank have tailings been deposited?

A.—Well, I say over twelve feet deep.

Q.—That is, about forty feet deep on the south side?

A.—About the same as it is on the north side, because I was there but a few weeks ago, looking over that section of country where the old telegraph poles were set in the red land, and I found them sticking out about from four to six feet out of the sand. A telegraph pole is probably twenty feet long.

Q.—Prior to the time of these tailings being deposited, what was cultivated on the banks on the south side of the river?

A.—Wheat.

Q.—To what point do you refer where the bank was twenty-five feet high?

A.—As far as the Yuba Ranch.

Q.—What was the average productiveness of this land?

A.—I don't know exactly; it probably reached fifty bushels to the acre, but the land on our side of the river was the same quality of land, and I have had as high as ninty-four bushels to the acre. I had eight hundred and eighty acres under cultivation. I cultivated pretty much the whole of it, except what I reserved for pasturage. My land averaged from sixty-five to seventy bushels, and over. I have had as high as ninety-four bushels to the acre. I don't recollect how many bushels I got from the whole ranch. One year I think I got eighteen thousand bushels; one year I got fifteen thousand. Of course we didn't have all the land in any one year. It is customary for farmers to change their crops—to put wheat on one portion, and corn on one portion, and leave a portion for hay and grass.

Q.—You stated that the principal damage was done in eighteen hundred and sixty-two?

A.—The first damage was done in eighteen hundred and sixty-two.

Q.—To what extent was the land damaged then?

A.—Well, it filled a portion of the bottom land, in some places from eight inches to two feet deep with sand—very little sediment. That sand in a very few years turned back into good corn soil. In about five years it was good wheat soil again, but this was mostly sand that came down at that time. Of late years there has been more sediment than sand coming down. It is this fine debris which comes down and fills up our lands and poisons the soil with alkali. We can make no soil of it at all.

JOSEPH JOHNSON

Sworn, who said:

My occupation is that of a civil surveyor. I am an engineer and a land surveyor both.

Mr. Ostrom—You have listened to the questions propounded to the other gentlemen. We would like to have you go ahead and give us your views on these questions. We wish to ascertain, in the first place, the amount of damage, if any, to the river channels caused by this mining debris, or in regard to the navigation of the streams you are acquainted with; also, to what extent the river beds and bottom lands have filled up. We would like to have you go on and make a general statement.

A.—Well, the filling of lands on the Yuba River commences at about section twenty-eight, township sixteen north, range five east, and from that to the mouth of the river. On the south side of the river it commences at about section thirty-three.

Q.—About how far from the mouth of the Yuba, where it empties into the Feather River—about how far above that?

A.—Well, it would be about ten miles; it runs diagonally.

Q.—What is the full distance?

A.—About twelve miles, the way they follow it out.

Q.—Have you been over this section of country?

A.—I have surveyed across it time and again, before it was destroyed and since it was destroyed.

Q.—How long since you began to be acquainted with these lands and these rivers?

A.—I began to survey this country in the fall of eighteen hundred and fifty-five, and have been surveying ever since. I commenced in October, eighteen hundred and fifty-five, at which time I took office as County Surveyor of this county, and ever since that time I have had a practical acquaintance with these matters.

Mr. Coffey—State how this injury to the land has occurred, from the beginning to the close. State what you know about the lands, about the filling in, and where it came from.

A.—I think it commenced in the fall of eighteen hundred and fifty-seven; from that it increased rapidly on the Yuba and on the Bear River.

Mr. Kercheval—What is your opinion as to the cause of this filling?

A.—My opinion is, it is caused by the tailings washed down from the mountains by the hydraulic mines.

Q.—I would like to have you state what kind of mining. There is a great question now, as I understand it, as to the washings by this hydraulic process. I would like to have you state what effect the mining had previous to this hydraulic mining, and what the relative effect has been since?

A.—I don't think that the mining ever amounted to much up to the time of the commencement of hydraulic mining.

Q.—When was that?

A.—I think they were at it to a certain extent in eighteen hundred and fifty-two and three. They commenced it then, but not in the way they work it now.

Mr. Ostrom—About what time did hydraulic mining amount to anything like its present proportions?

A.—They have been all the time advancing and making greater improvements.

Q.—You think the injury began about the winter of eighteen hundred and fifty-seven?

A.—Yes, sir.

Q.—State from that time what has been the progress of the injury to the land?

A.—The sloughs along the lands were filled up with slickens—that is the term—that is the sediment out of the top soil of the mines.

Mr. Coffey—Are slickens and tailings the same thing?

A.—No, sir, they are entirely different.

Mr. Ostrom—In about what proportion has this filling been going on from year to year? Has it increased each year over the previous year?

A.—I think it has. Up until about three years ago the river never had run across the road over here at Dunning's Place. It never had run across there to the knowledge of any man here, and since that time it commenced running across there in the spring of the year. Since that time it has been increasing very fast every year; it is increasing faster now.

Q.—About how many acres would there be on the Yuba bottom?

A.—I never computed the number of acres. Approximating it, I would say about from twenty-three thousand to twenty-five thousand acres on the Yuba River.

Q.—Are these tailings productive, or what value are they where the land is covered with them?

A.—When they first came down the river you could cultivate the land, but it has got so now you cannot cultivate it or make anything grow on it; they were valuable to the land the first two or three years, but it has got so now that it won't grow anything. It is a light sand now, and entirely unproductive.

Q.—About how deep do you think the Yuba River bottoms are filled up with these tailings, on an average—take the bottoms clear across the bottom lands and the bed of the river?

A.—In eighteen hundred and seventy-two I superintended the embankment on the south side of the river, and we scraped down to the depth of six feet and didn't strike any soil. We dug down six feet and struck the soil in two places. There were other places we never struck it. We have struck water but no soil. That was right where I have seen them raise corn.

Q.—Are these deposits deeper up towards the mountains?

A.—Yes; the higher up you go the deeper they get.

Q.—In relation to the channel, what resemblance does the channel of the Yuba River have now to what the channel was formerly?

A.—The channel is changed in many places altogether. You can follow the old channel, but the water doesn't run in it, except when it is very high.

Mr. Coffey—You mean the water does not run in the old channel except when it is very high?

A.—Yes, sir; the channel is filled up and the river runs a mile away from it to-day.

Q.—About what value would you estimate, at this time, these lands—known as the Yuba River bottom lands—to be worth, if they were as good as they were previous to the destruction?

A.—One hundred dollars per acre.

Q.—You say you are acquainted with the Bear River country; about how much land has there been destroyed on the Bear River bottom?

A.—Well, I didn't think I would be asked that question, and I haven't figured on it so as to know exactly. I lived on Bear River and the whole of the piece of land I lived on is from seven to ten feet deep with tailings.

Q.—You are a farmer, then, as well as a surveyor?

A.—I lived on the bottoms there for some years. I don't own any land to-day. All the land which I ever owned on the river has been destroyed.

Q.—Of what comparative value were the bottom lands on the Bear River with those on the Yuba River?

A.—I don't think the natural bottom lands on Bear River were naturally as good as those on the Yuba River.

Q.—Now, you are a surveyor—what do you think of this project which has been spoken of in regard to filling up the tules with this debris? Of what value would the land be if it was filled up, provided it could be done?

A.—If you didn't get it too deep it might answer.

Q.—About how deep would it have to be?

A.—Whenever it got so that the light sand would come down, then it would be too deep.

Q.—What do you think of the project; as an engineer, what do you think of the feasibility of it?

A.—I have my doubts whether it could be carried there, from the fact that it would lodge in the flume. If you had nothing but a ditch it would be sure to do it.

Q.—The project was spoken of by gentlemen in San Francisco, that the Yuba River might be carried across Feather River, and perhaps deposit tailings over across in the large basin. What is your opinion in regard to that?

A.—Well, if you did you would have to raise the water high enough to be above the high water-mark of the Feather; that would raise it several feet above the face of the earth here. You would have to get above the high water-mark of the Feather River in order to get across. That would be several feet above its present banks.

Q.—You have seen a great deal of this country here for fifteen or twenty years. There is another project mentioned, and that is to take a canal out of the Sacramento River, some five or six miles above the junction of the Feather and Sacramento, and it is proposed to carry a large portion of the Sacramento River, at high tide, in that canal. That is the proposition—to take it out, say, about six miles above the junction of the Sacramento and Feather Rivers. Now, what effect would that have on the Sacramento River below the junction, to take that clear water out of the river?

A.—Well, it would have a tendency to fill the Sacramento River up faster than it is filling now, and it would relieve Sacramento City from being drowned out, I believe; but it would naturally fill up the channel more with the sediment. The less water that runs in the channel of the Sacramento River, from the mouth of Feather down, the more it is going to fill up.

Q.—I ask your opinion, now, as an engineer, from your observations. Give us your opinion on these things.

Mr. Coffey—The fact of this water being taken out, you think, will lessen the force of the current?

A.—Yes, sir; it undoubtedly would.

Mr. Kercheval—I want to know your opinion, now, whether or no it would decrease the scouring force of the water to cut this channel from the Sacramento and divert this water in the manner proposed?

A.—It would have a tendency to draw the water off, at high water, from Sacramento River above the mouth of the Feather, and there would be less water and less current, and consequently it would deposit more debris. It would decrease the scouring force of the river.

Q.—Now, you say it would decrease the scouring force of the water, and allow this sediment to settle—invite it to settle. Would not that evil overcome all the benefits derived from this diversion of the water, by raising the bed of the river?

A.—Yes, sir, it would.

Q.—No benefit would be derived from this cut?

A.—No, sir, I don't think there would be. As long as these tailings go down, the water that runs in the Sacramento will carry it on down, and the longer it will be in filling up.

Q.—The benefit would be but temporary?

A.—That is all.

Mr. Coffey—You have been asked your opinion as to particular modes of relief. Now I want to know if you have thought over any mode yourself; anything besides these modes suggested as to diverting the channel; any practical method by which the land could be saved or reclaimed?

A.—The only way I see for it is to keep building the banks on each side of the river and not allow the waters to spread out, and force it right along. It would not relieve this country here any more than below.

Q.—It would aid in filling up the bays and harbor?

A.—Yes, sir; it is going in there right along.

Q.—The building of the banks of the river would save the land here and injure the harbor below?

A.—Yes, sir, it certainly would.

Q.—You have not thought over any particular method of relief?

A.—No, sir, I never have.

Mr. Dibble—Have you ever made a careful examination as to the extent, from the junction of the Feather River, where the debris has covered the land?

A.—The bottom land commences on the west half of section thirty-two; I mean the bottom land, not the gravel land.

Q.—Now compute it, in miles, as near as you can. How many miles from the junction of the rivers up to the upper point where the bottom land has been covered?

A.—From that section clear down to the mouth of the river.

Q.—Is it ten miles?

A.—Yes, about ten miles, I should judge.

Q.—Does it exceed eight miles?

A.—Yes, sir; it is ten miles. It might be a little fraction under.

Q.—Have you ever made surveys across the river for the purpose of ascertaining the average width of the bottom land, commencing at section thirty-two and running down to Marysville?

A.—Not for that purpose. I have made surveys, but not for that special purpose.

Q.—Then you haven't made surveys for that purpose? Tell me about how wide it is, commencing at the bridge and running up.

A.—Here at this railroad bridge it is about one and one-eighth miles wide; that is the narrowest place there is. From there up it increases until it is three miles wide.

Q.—What would you call the average width of the bottom land?

A.—I don't think it would average three miles all that distance.

Q.—At what point did you find the bottom lands three miles wide?

A.—Well, you may take it from the corner of section thirty-three; there I think it is about three miles wide.

Q.—You stated that about ten thousand acres have been covered. Do you know anything of the source of that debris, of your own knowledge?

A.—Well, it comes from all the mines on the Yuba River and its tributaries.

Q.—Have you ever made any calculation as to the amount of wash that would be carried by the water into the Yuba River below section thirty-three?

A.—No, sir.

Q.—Take the North Bloomfield Mine; do you know how much of it is gravel, and how much of it is sandy material?

A.—I have never been there since they commenced mining with hydraulics. I don't know what they are doing in that respect.

Q.—Do you know, in mining operations, the amount of surface that would float with water and be carried down below section thirty-three?

A.—I cannot answer that question correctly. You can take a bucket of water here, and you will find nothing but sediment in it.

Q.—I mean the material that would be carried down. You go into a hydraulic mine, and what kind of gravel do you expect to find there?

A.—Well, I would find coarse and fine both.

Q.—Do you think the coarse gravel would find its way down below section thirty-three?

A.—No, sir.

Q.—What proportion, then, would you say of the face of the mine would be carried away by the water?

A.—I have never figured on it. I do not know the exact proportion.

Q.—Have you ever examined, or do you know anything about mining interests?

A.—Yes, sir; I was in Nevada City before there ever was a hole sunk.

Q.—At the time you lived up there was there any hydraulic mining going on there?

A.—What would you call the operations of Mrs. Ladd?

Q.—That was placer mining?

A.—Is it not placer mining where they use hydraulics?

Q.—It commenced in eighteen hundred and sixty, somewhere along there?

A.—They were using hose, or pipes, way back in eighteen hundred and fifty-three.

Q.—I want to learn from you whether you know the proportion of a gravel mine or bank that would be carried away by the water?

A.—Well, I cannot state the proportion, and I don't think any other man can.

Q.—Have you ever examined Nevada County for the purpose of ascertaining what the natural washing is?

A.—No, sir; I never went there for that purpose.

Q.—How many farmers are cultivating rolling lands there from which the natural wash would be carried off into the streams?

A.—I don't doubt but what there is some.

Q.—You think the current of these streams can be so diverted as to make lands?

A.—If you run this sediment down on the tule lands it will fill them up.

Q.—Then it makes a new channel and fills up the surrounding sections; draws the debris off and makes land?

A.—Yes, sir; and whenever this light sand gets on it, it is not productive.

Q.—Then you think it destroys the land?

A.—It makes land for the time and then destroys it again.

Q.—Now, I understood you to say that the Yuba River came down and butted against the Feather. Now, would it not be a perfect relief to take the water out and conduct this debris onto these lands?

A.—If you take the water out of the Yuba River and run it through a canal onto these tule lands, it would relieve all the lands between where you take it out and where you deposit it.

Q.—Now, if by means of this canal, you conduct this debris, and put it on land that is now worthless?

A.—It may benefit it for a time, but after all when the light sand comes upon it, it will destroy it.

Q.—Is it not your opinion that a canal, constructed in this manner, would be a permanent relief, and would save property here?

A.—As long as you stop it from coming over the land it would.

Mr. Kercheval—You stated that you formerly resided on Bear River?

A.—Yes, sir.

Q.—How far from your residence is it to the mouth of Bear River, to the junction?

A.—About three miles along the river.

Q.—How far is it from your residence, following the river, to the point where Bear River comes out of the mountains?

A.—Well, about sixteen miles.

Q.—About nineteen miles altogether from the mouth of the river to where it comes out of the mountains?

A.—Yes, sir.

Q.—Can you state what amount of land has been damaged there by this water and debris, and what amount of damage you think the land has sustained by these deposits?

A.—I could not say, sir.

Q.—Not what each individual has been damaged, but what the gross amount of damage is; damage that has been sustained there up to the present time?

A.—I think there has been an average of a mile wide all the way that has been destroyed.

Q.—That would be in the neighborhood of twenty sections, or fifteen or sixteen thousand acres?

A.—Yes, sir.

Q.—What was the value of that land previous to the time that this debris settled on it and destroyed it?

A.—There was land on Bear River held and sold at thirty dollars an acre just before the flood of eighteen hundred and sixty-two; that was the best quality of land.

Q.—Wasn't the flood in the year prior?

A.—Previous to eighteen hundred and sixty-two and three there was a portion of this tract of land that I speak of being sold that was upland; it was not all bottom land.

Q.—I want to know what the average value of this bottom land was that has been destroyed by the debris—what the average value was previous to these deposits? We want to make this matter of damage as plain as we can.

A.—Go back to eighteen hundred and sixty and eighteen hundred and sixty-one, lands were not rated then as high as they are now; bottom lands then were worth twenty and thirty dollars an acre.

Q.—That would be the average value of the bottom lands?

A.—I think it would. I think you could take a strip a mile wide up and down Bear River and it would average that; I don't mean to go way out.

Q.—Now I will ask you what that land is worth at the present time, in its present condition?

A.—A large portion of it is worth nothing, except for timber. There is some land which they have redeemed by levees; it is very valuable land.

Q.—How much is that land worth that has been redeemed by levees?

A.—They have paid as high as fifty and sixty dollars an acre for some of it.

Q.—Has that been redeemed permanently, or only temporarily?

A.—That depends on how well the levees are made; they have got to continue raising the banks all the time.

Q.—Will they be able to hold it and keep the water off of it; can they do it for any great length of time if mining still progresses on its present grand scale?

A.—I think there is a time coming, if mining continues on in the same way, when these men will be drowned out, because the freshets will cease to have any chance to run out; when that time comes the water will raise there and cover the land they are on.

Q.—Now, these parties having leveed the banks thus, and holding the water in check, in case after a while these levees should give way, and be unable to carry and pass the water through—if they should break, what would be the effect on the country around there, outside of this strip a mile wide, which you say has been filled up; would it spread over the country?

A.—Yes; land that has been redeemed, if they should break, would fill right up again.

Q.—Now, I understand this, that the bed of the river, where it is confined within these levees now, is several feet above the lands outside of these levees; that the channel, or bed of the river, is that much higher than the country around. Now, in case it gives way, would these waters not be precipitated all over this country?

A.—Yes, sir; most certainly; it would fill them right up. If they ever allow these levees to break, they are gone. It will fill it right up with sand and debris.

Q.—Now, state to this committee—give us your opinion—what is the great source of the filling; does it come from the agricultural lands which have been ploughed and cultivated, or does it come from the mines?

A.—Undoubtedly some of it comes from the ploughed lands in the mountains; but the greater portion of it comes from the hydraulic mines.

Q.—About what proportion?

A.—I think a very small proportion comes from farming lands.

Q.—About what proportion comes from the mines, in your opinion?

A.—About ninety-nine hundredths.

Mr. Ostrom—As to the value of these lands; you think now it is worth about fifty dollars an acre?

A.—Yes, sir; you could not buy it for a hundred dollars an acre.

Q.—But it is entirely out of market?

A.—This land that has been reclaimed, if it was not for the fear of the levees breaking, and the land being overflowed, you could not buy it for a hundred dollars an acre.

Mr. Coffey—As to the proportion of this debris that comes from the mines, repeat that statement?

A.—Well, ninety-nine hundredths comes down from the mines—ninety-nine parts out of every hundred. One-hundredth part may come from the washings of the agricultural lands.

W. H. PARKS

Sworn and examined.

Have heard the questions propounded to the witnesses, and am familiar with the objects sought to be obtained in this examination. My name is W. H. Parks. I am a farmer and stock raiser by occupation. I have lived in this country since eighteen hundred and forty-nine, and have been engaged in stock raising since eighteen hundred and fifty-two. I have cultivated the soil also, but was more of a stock raiser than a farmer. I have pursued my present occupation since eighteen hundred and fifty. I am acquainted with the country that has been damaged by these overflows of debris, all the way from the source to the outlet. I think I am acquainted with all the lands north of the Sacramento River.

Mr. Ostrom—I want to know now the extent of the damage to the country, and the cause of it.

A.—The bottoms on the Feather, Yuba, and Bear Rivers are substantially ruined. There are a few exceptions—but a very few. There are a few on the Yuba River; there is a small portion of the bottom lands on the Yuba River that are not destroyed. On the Bear River the bottom lands are destroyed for over ten miles from the mountains down, except now and then a field. I think there are some exceptions also on Bear River, but they are not worth mentioning.

Q.—What is the width of the damaged country?

A.—I have listened to the answers from the other witnesses, and have come to some conclusions. My recollection of the Yuba River—and I came on that river in an early day—is that what is called Blue Tent, up about six miles from here, was fine bottom land down to the boundaries of the city. Above there, up to Long Bar, it was inferior gulch land. On the other side, some little distance above that, down to where this bridge crosses, was fine bottom land. Here, opposite the city, it was a fine quality of land; and I think in the tract on this side there were about eight sections of land—about six sections on this side, and about two sections on the other side. Altogether, there is fourteen or fifteen sections of A No. 1 land, which has been entirely destroyed, with the exception of what has been leveed here, and that has cost all it is worth to save it. This part of the land which is above Marysville was very valuable land; in fact, it was all very valuable land. It would yield, I think, as Mr. Drum has stated, from forty to seventy bushels of wheat to the acre, on winter sowing. If this land was now in its then natural state, it would be worth one hundred dollars an acre.

Mr. Kercheval—How much of second class land was there?

A.—Not a very large quantity, sir. The red hills come in very soon after leaving the bottom lands. There was very little of it. The river, after you get above this point I speak of—its shores were rocky and graded off into coarse gravel deposits.

Q.—You are speaking about the Yuba River?

A.—Yes, sir.

Q.—You heard Judge Dibble's question to Mr. Drum as to the length of the damaged country?

A.—Yes; but I hardly understood it.

Q.—I want to know about what the length of the damaged country is?

A.—I think Mr. Drum perhaps overstated the length, and hardly had it wide enough. My opinion is that it does not run above six miles above Marysville, and then perhaps a mile and a half from the railroad bridge down, say two sections of land, on the opposite side of the river. I think there was about six sections of land on this side—north side—of the river, between the northern edge of the town and the old Blue Tent ranch. I think there was about six sections of land, of the very first quality of land, and as much as eight sections on the other side.

Mr. Coffey—What was the cause of the damage?

A.—The sediment from the mountains.

Q.—From your observation and knowledge, how long is it since it began the work of filling up these lands?

A.—I think there is no doubt but what it commenced before hydraulic mining commenced. I have no means of knowing exactly when it did commence. Undoubtedly, a very large percentage of it at the present day comes from hydraulic mining. I don't think it is from the increased amount of dirt being washed that makes it show so much now as that after it filled the original bed of the river, and extended over this great flat, that it deposited sediment much faster than it would if it had been confined to the river bed. It makes a greater show on that account, and I suppose the mines are being worked to a greater extent. There is another reason why the deposits would be made much faster, even if the mines were not being prosecuted to a greater extent. The river bed, above where the river comes from the mountains, has been raised to a very great height—one hundred and fifty feet probably. That gives the river at that point so much more fall that it precipitates coarser gravel, and a much larger percentage goes into the river and is washed down than was the case before the river bed in the mountains was raised to its present height.

Q.—Running back some years, can you average the annual injury done?

A.—The injury to the land on the Yuba River has been running for a number of years. It is almost worthless now, and has been for some years. It might raise some wood willows. The land for agricultural purposes was ruined six or eight years ago. In my opinion it is now past reclamation.

Q.—Can you arrive at an approximation of the damage as it stands at present, in round numbers?

A.—I don't see that the damage is increasing to any great extent, because it has destroyed all the valuable land on the banks, so that it is not worth over five or ten dollars an acre, the best of it, so I don't see that there is any very great damage going on now. The land on the Yuba River is destroyed, all destroyed. It makes no difference now whether the tailings are five feet or twenty feet deep, it is past reclamation in my opinion.

Q.—Have you thought about any remedy for this?

A.—Yes, I have given the matter some thought.

Q.—By the way, did you ever represent this county in the State Senate?

A.—Yes, sir, I was State Senator.

Q.—Give us your ideas in regard to any conclusions you may have arrived at as to the remedy.

A.—I think there is a remedy; but it is one thing to find a remedy and another to apply it. The great trouble is to make the application. It requires money, and it requires a Legislature that has got the nerve to vote it. Now, my judgment is that all the coarse gravel coming from the mountains can be carried in the original river beds as they are, with sufficient levees to concentrate all the waters and keep them in the rivers. My judgment is that by this course this debris can be carried down to the Bay of San Francisco. In making this assertion I don't overlook the fact that there is one difficulty, attended with considerable expense. I don't consider the expense of levying the rivers to be very great. As I said, the rivers above have filled up to such an extent, and the fall has increased so much as to throw down coarse gravel, and almost cobble stones begin to come down. That never can be carried in the channels of the rivers in anything like the grade that can be obtained between here and San Francisco, and there must be provision made for depositing the coarser material in that section of country near the foothills. As to that, I don't think any man would be justified in giving a plan until after a thorough examination by a practical and competent engineer. I don't think any man could sit on the witness stand and answer such a question as that. I have an idea that surveys can be made and some plan adopted by which this coarse material can be retained and the other carried to the bay. They can be retained at different points on the river. In regard to taking these rivers across the country in canals, I don't entertain an idea that it is practicable at all. I don't think it can be done at all. In the first place, if you ever set that river afloat down there in that country, it will get beyond your control, and you cannot control it at all. It will tear your country all to pieces. It will run out at all points of the compass. These rivers have been millions of years in making, and at one time we had the finest banks of any overflowed country ever heard of. You undertake to turn the Yuba River across the country, and you will find that you have lost control of it, because there is a great deal of filling, and no man can tell what the result would be. But if you can draw this coarser material into a reservoir, and allow all that the waters have power to carry, and you can scour these rivers out nearly to their original depth.

Q.—What effect would that have ultimately upon the Bay of San Francisco, as the waters are now charged?

A.—No river like the Sacramento River can empty into the bay without retaining its channel. I do not set up my judgment in the matter as worth much. The first destruction, if there is any, would be in and around Mare Island, and the government would be the first loser. But all this time there must be an outlet. The tide would form a flood and carry it out to sea, though it might shoal in places.

Mr. Ostrom—In regard to this canal spoken of, what do you understand about the location of it, and the benefits arising from it, and the damages?

A.—I had just stated that when a river like the Sacramento River is taken out of its banks and taken across an alluvial country, no man can predict what the result will be. I cannot see any good to come from it. If they take one-third of the Sacramento out at the point they spoke of and give it full scope, it will run there in ninety days, and before one year the Feather River will throw a bar across from Fremont to Vernon. I understand they want to limit it by a weir of some kind, so as not to have the water run over except at a certain height. My answer to that question is that such a canal would be no relief at all. It would be of no earthly account. It would lessen the current of a volume of water, and that would cause it to shoal to a great degree. They would not have power enough. If they had power enough that would take all the debris off. Every time you divide water you lessen its power. It seems to me that such a project would be right the reverse of what you want. If they had power enough it would take the debris and carry it right along. Then, if you haven't power enough now, when you come to divide the waters you have still less.

Mr. Ostrom—In San Francisco three gentlemen appeared before this committee, Professor Alexander, Professor Davidson, and Colonel Mendell, and asserted that there was a great proportion, a large amount of this sediment, came from the agricultural districts in the Sacramento Valley.

A.—I so read the question and the answer, but I am informed that the question was confined to the Bay of San Francisco, and I think that Professor Davidson, as a scientific man, would not be likely to make such an assertion. If he did make such an assertion it would be an insane answer. If it was applied to the Bay of San Francisco there is some doubt about that. Up to the present time there has been a little sediment deposited in the Bay of San Francisco. At South San Francisco you can find traces of the sediment. If his answer was applied to the Bay of San Francisco I am not sure whether he was wrong or not. If his answer was applied to the rivers in this valley it is simply an insane answer. The country here is such that there is very little material going into the rivers from the cultivated lands, for this reason: that during flood-time there is an outflow from the rivers, and whatever washes from ploughed land washes out into the basins. Farther than that, three hundred and sixty-five days in the year these rivers carry this mining debris, and there is not to exceed twenty days in the year that the waters are charged from this ploughed land, all the rains that fall are absorbed by the soil, so that not more than twenty days in the year would anything come from the agricultural districts, even if it went into the rivers at all. It would be very small in point of time, and much less in point of quantity. It is true that in the mountains all the sediment that comes down is not directly from the washing of the mines to-day. Perhaps the very dirt that we washed out in eighteen hundred and forty-nine is just going down now and filling up the streams. This all contributes, there is no question about that. It is the natural tendency of the mountains to go to the sea; that is, a very small proportion, but it cuts some figure. No man digs a road that he does not loosen some of the soil, but the great source is from the hydraulic mines.

Mr. Coffey—You heard the answer to the question about the proportion of sediment and mining debris that causes this destruction to the land?

A.—I think it is a safe answer to say that it is the hydraulic mines that cause this destruction; that if they were not digging ditches and mining, that all the material that comes into the rivers would be immediately transported to the bay. The rivers have a capacity to convey it all. It is so light that it will go with the current, but the mining operations are what forces this heavy material down; it is the last ten or fifteen feet of a gravel bed that causes the destruction here, grinding up these rocks into sand; it rolls off down the rivers and deposits as the water loses its force. I wish to say something in regard to the proposition of conveying this debris down and making land for us in the tules. You can't convey it there, sir; you can't do it. In the next place, we don't want it there, if you can. In low water the water is five feet lower than the lowest parts in Parks' District. Just how Mr. Redding proposes to get that up five feet, I don't know; but if he succeeds he has only done for us what he has done for the Yuba River. The lighter material will float off and leave us the heavy gravel and sand, to be filled up at the rate of about two inches a year, and the cottonwoods and willows would start up all over it. At the end of ten years we would have trees ten feet deep. It renders the land absolutely worthless for anything, except the cottonwood and willows that grow on it. They will grow ten feet in a year. You go onto the land and you will find a tree every five feet; cut one of these trees off, and five more will come for every one of them. Attempt to dig it out, and there will be a hundred grow in its place. You can't clear it off for one hundred dollars an acre. But the answer is, that he can't put it there without taking it out above Marysville, and building a flume higher than the levee at Marysville, and carrying it down through one of the richest agricultural districts in the State of California. He would have to take it from the base of the mountains.

Mr. Garver—Do you think it would be worth while for the State of California to employ two or three competent engineers to investigate this thing?

A.—I say they should employ about five Commissioners, with authority to employ as many of the best engineers of the world as they may deem necessary, and furnish them with means to execute the work. It can be done, but it is only a question of enough funds. The expenses of that commission should be borne in proportion to the assessed value of all the land that is under water to-day. That would be pretty good, and also the people of the mines that contribute to the riling of these streams. We should have this commission immediately, with power to do this work, and the State should issue bonds for the construction, and hold the mines and tule lands in trust for the payment of them. To that extent I am in favor of a commission. They should have absolute power, when they find a remedy, to apply it. It should be done right now. There are many things and facts which might be drawn out by the investigations of the commission that would be interesting to the whole world, but while they are getting these facts we are losing time.

Mr. Berry—As we are legislators, seeking the good of all concerned, your suggestion is that a commission be appointed, with full authority to adopt any plan that these engineers may think feasible, and issue bonds, the State to guarantee the interest on these bonds, and hold the mines and swamp lands in trust for their payment?

A.—Yes, sir; that is my theory.

Q.—Now, might not this result happen: that before we get these bonds paid, and the work done, the mines might be worked out, and they never pay their proportion of the fund? In that case the bonds would still be in existence. We want to know when these bonds will be paid.

A.—My opinion is based on this calculation, and I assert that it is my firm opinion that the waters of the Yuba, Feather, and Sacramento Rivers can be carried below Sacramento for less than five dollars an acre on the land, without the mines. For five dollars an acre it can be carried down there. The land, after the water is carried down there, is worth fifty dollars an acre. At present, it is not worth a cent. Now, if a man can't afford to give five dollars an acre for fifty dollars, it is tough times. The mines must exist long after you and I are dead, and they will contribute their share. It is simply a question of getting a Legislature that will do its duty. The water is now higher than it was in eighteen hundred and sixty-two; it might be a little higher after it gets to Sacramento. The Sacramento River is not filled in to any extent above the junction.

Q.—I mean all the water, whether it be in the channel now or not, that would come to Sacramento?

A.—We never would have all this water here; it would be deposited in the Bay of San Francisco. Now there are localities where it must be higher. It is higher here, because the bed or bottom of the river is about as high now as it was at that time—about as high as the surface water; but when you get down to Sacramento it is not filled up as much as it is in the willows. It does not decrease the carrying capacity of the river filling the holes up. I don't know the exact elevation of the river at Sacramento, but I think it is two or three feet. I think the low water-mark now is about three feet higher than it was in eighteen hundred and fifty. My plan is this: to appoint five citizens as Commissioners; leave the appointment to the Governor, where I suppose the appointing power belongs. These Commissioners should be authorized to make a complete list of every foot of land that overflows at the present day; they should make a list of all the mines. that contribute to the riling of the streams. And this Board of Commissioners should be a Board of Equalization between the different sections of country, and between the mines and agricultural lands. That the State shall issue bonds for the carrying out of the work. That the method of providing for the redemption of these bonds shall be the assessing of all the lands that are overflowed, and of the mines that are now being worked and shall hereafter be worked. It ain't supposed that the people of Los Angeles County would want to be taxed for the purpose of protecting and improving my land. Nor is it justice that we who have been so badly injured should pay the whole. Nobody will doubt the ability of the mines to redeem these bonds, nor the ability of the swamp lands.

Mr. Coffey—What is the difference between your idea and that of Professor Davidson?

A.—There is just this difference between my idea and the idea of Professor Davidson and the miners: The miners want a commission to find out whether this debris is really coming down on to our lands or not, and they want the commission to find out whether this land does not overflow, and report to the Legislature. Now the difference between them and myself is this: They want the commission to investigate and find out whether this really is the case or not, and I want the commission to examine and determine upon a remedy, and, when they have found the remedy, to have full power to apply it.

Mr. Kercheval—There is a rule of law that if a man runs water onto me, and ruins me, he shall be liable for damages, and can be prosecuted. It seems strange, to me, that if these hydraulic mines are throwing their debris down upon this land, and ruining the whole country, that we, who have been ruined by it, should be taxed to take care of their slum and tailings.

A.—This will be a benefit to our lands. It is not a cent in the pockets of the miners. It only enables them to clear themselves. It will make my land worth forty-five dollars an acre. It is worth about two and a half now, and I will make forty-two and one-half dollars an acre clear. The miners don't make any money by being taxed, they simply evade a lawsuit. On the question of law, I was in conversation with some gentlemen in regard to lawsuits. I took the ground that this is a good time to compromise, because if the miners beat you they will never consent to a compromise; if you beat them you will not compromise. It is to the interest of the State that the mines should be worked if it can be so done as not to injure the property of others. We cannot say that the mines shall not be worked any more. I say apply the remedy before the question is settled. If you cannot make the miners pay in this way, they will never pay anything. You as legislators have the power to make them do it, and it only requires the nerve. I would not ask them whether they will consent or not. By this plan I propose there is not a dollar to come from the State treasury. I know Mr. Kercheval's position. He represents a very large extent of country on which a great deal of money has been spent for costly works of reclamation. Of course I would not include that. If they make such a levee as you want all right. But you say to Sacramento, you must make your levees of a certain height, or we will do it and charge you with the cost of building them. Here is District Number One with sixty thousand acres. Of course we would not expect to take them in and tax them. We merely say to them make your levees secure.

Q.—Are they not running this debris on that land in District Number One?

A.—No, sir; they have a fine agricultural country; it is true it has been filled to some extent.

Q.—Will not that eventually become in the same condition as the Yuba River?

A.—No, sir; not for a great many years. Not in a long time.

Mr. Smith—Your idea is to scour out the Feather River?

A.—It will scour it out sufficient to carry off the water, and the more water you put into it, if it is confined, the better it will scour it out. Just as you increase the number of horse powers in an engine, the more work it will do. If you had power to fill it with water to twice its present height, the more it would scour. It is only a question of quantity.

Mr. Berry—You stated that there was about two or three feet difference in the water-marks at Sacramento—that was at low watermark?

A.—Yes, sir.

Q.—Now, what is the difference between the river at low water-mark now, and at low water-mark in eighteen hundred and fifty?

A.—I don't see why there is not as much water.

Q.—Isn't it a fact that there was fifteen, or sixteen, or twenty feet of water in eighteen hundred and forty-nine, at low water-mark?

A.—Yes, but it is not fair to say that the river has filled up that much, because of the filling of the holes. The fact that the holes are filled up that much, does not diminish the carrying capacity that much. In front of Nicolaus it has simply shifted the river there. The river bed now, instead of having these deep places, is one incline plane from the mountains to the sea.

GEORGE OHLYER

Sworn, and examined as to the Feather River.

I have lived in the vicinity of Feather River ever since eighteen hundred and fifty-two; I have been accquainted with that section of country ever since I came here. I first lived in this county and then moved into Sutter County. I have lived here since eighteen hundred and fifty-two. My business now is that of a farmer, and has been since I first came here. I was absent, temporarily, part of two years, from the State. I came back, and, with that exception, I have been farming all the time. I have lived here continuously since eighteen hundred and fifty-six. I have lived here without interruption, in this county and in Sutter County, for twenty-two years. I have lived on the Yuba, and the Feather River, some four miles above here.

Mr. Coffey—Now give us your knowledge of the damage done on the Feather?

A.—Yes, sir; though I am very familiar also with the destructions on the Yuba, and there are some things that have not been mentioned that I would like to state. On the Yuba, aside from these rich farms that have been destroyed, there were immense orchards. Perhaps you will remember the Briggs' orchard. That was one of the finest orchards in the State, and was entirely destroyed. The year before it was destroyed, it was valued at two hundred thousand dollars—for about one hundred and fifty acres. Just above Marysville, here, there was a tract of peach orchard, just above, in the bend of the river, all fine bottom land, and that was also entirely destroyed. So, also, above, there were several fine orchards destroyed—perhaps over two thousand acres. That is a fact that has not been before touched upon here. Some two years ago, when an estimate was made of the damage, these orchards were included in it. From here down, outside of the limits of the city, there was quite a town, clear down to the Feather River, and there were perhaps fifty or sixty houses, of course, at one time, worth a great deal of money. All that has been destroyed. Not a house is to be seen there now. There were two large mills, a brewery, and a fine private residence, and orchard. As to the Feather River, the destruction there is not so great, because we are not covered with sand to such an extent as they are on the Yuba. The Feather River, being filled more or less with sand, has raised the water, and lands that were too dry for wheat, in eighteen hundred and sixty, are now lost from being under water two-thirds of the year. This is the case below the mouth of the Yuba, as well as above, where no debris run from the

Yuba. Below, the water has raised, on account of the river being filled with this mining debris, until it has ruined this land. Above, the water has backed up, and, as this forms a natural dam, the water is now perhaps fifteen feet higher in the Feather River than it was fifteen years ago, at low water. The consequence is, that for six or eight miles up the Feather River the river is held back, and has covered the bottom lands and destroyed them. I think Mr. Parks said that on Feather River there was very little mining, and it would not be destroyed. The Feather River was clear until about three years ago, and since then it has turned yellow, and there is mud in it, and we find that they are using Feather River as a dump for the mines above Oroville. It is about twenty-eight miles up there, but the history of the Yuba will certainly be repeated if they continue using the Feather River as a dump, as they are doing.

Q.—How long do you think it will take?

A.—I have no means of knowing how extensive their mines are on that river. Sometimes we hear they have very extensive deposits. They are running it into the rivers, and the first winter that a heavy freshet comes it is liable to bring it down upon us and destroy a great deal of property. That was the case with the Yuba River. It was quiet until the great freshet—the great flood came. While there is no great flood it may not come down. As to the value of this sand, there is no value to it. Nothing but harm can come of it. There is some of the finest bottom lands on this river that there is anywhere.

Q.—I understood Mr. Parks to say that there was no damage done to the Feather River—that is to the lands.

Mr. Parks—I spoke of District Number One. It was through the exercise of their energy that these lands were preserved. I know of no very serious damages as yet. I didn't mean to say that the Feather River, if it had been left in its natural state, would not have been damaged. They rely on the amount of property in the district for their protection.

The witness—The prospective damage lies in this: That if the levees built to protect District Number One from this sediment and dirt—if the history of the Yuba River is repeated on the Feather, the channels will fill up from Oroville, and every distance this side, until it runs water over the plains, and thus it will go down and back water against your levees that protect District Number One, and run all over the lands and ruins them. The people living in Yuba County, and in the upper end of Sutter, will have to levee against it or else be ruined.

Q.—Are you interested in District Number One?

A.—Yes, sir; I live there. In District Number One the main stream is full. Mr. Parks says that we can protect ourselves, and run this debris to the bay by keeping it together. Some of us, perhaps, don't see it in that light. The Yuba had a channel once, a very deep one. The Feather had a channel once, a very deep one from here down. And yet these channels are filled up. Now it is proposed that we levee; that the farmers raise all these levees and preserve these channels. My impression is that these channels will keep filling until you get the whole surrounding country filled. Levees will break. Number One breaks almost every time we have a first class flood. I don't believe it is possible to hold the Feather River within two levees. I don't think it is possible. There is only one levee here.

Q.—Does it hold the waters in where it is leveed on both sides?

A.—It has held the water this winter, but we have had no high water in the Yuba or Feather. It has broke every time we had these high waters. This State has not got money enough to hold these rivers within two levees. That is my opinion. If you allow mining to go on these channels will fill and you can't levee against it.

Mr. Berry—Mr. Parks thinks different. Now we have a direct conflict of opinion as between two men who have carefully observed the subject matter. Now Mr. Parks comes here with a plan, based on his observations and judgment, and experience, and your opinion is that it will never work; that it is not right. Now is not that an illustration of the fact that there will be disagreements among the best of men, and that we should have a commission appointed?

A.—Yes, sir; I most certainly think so.

Q.—Then you think the present Legislature should confine itself to the appointment of a commission to ascertain the best means of relief?

A.—Yes, sir; that is my idea.

Q.—Not to carry it to the extent of giving them power to carry out any measure they might see fit to adopt?

A.—No, sir. I don't think I would be willing to go to that extent. That is my position.

Mr. Coffey—What is your judgment as to the damage done to all property, aside from the land destroyed, on the Yuba River? You spoke about property being destroyed other than land.

A.—Well, I will give you an illustration: All the lands destroyed on the Yuba, or what are known as alluvial lands—that is, if they didn't produce wheat, or barley, or corn—

Q.—The point I want to get at is this: You spoke of a number of houses, mills, and breweries that were destroyed. I want your judgment as to the value of that property.

A.—Well, I don't know what orchards really were worth. They were very valuable in those days. I was going to show you that the personal property, aside from the land, is generally considered equal in value to the real estate.

Q.—You needn't give us any construction of the law. You spoke of certain property being destroyed?

A.—Yes, sir. I believe that all that kind of property—orchards, mills, and houses—destroyed by the Yuba River, will run from a million and a half to two million dollars.

Mr. Berry—Can you approximate the amount of land destroyed in any way, in figures? Can you give us the approximate value of that land? Thus far we have the amount of real estate and personal property and improvements; is it worth ten dollars an acre, or what?

A.—I made an estimate some two years ago, of the total destruction on the Yuba. I believe the orchards destroyed were worth half a million of dollars—on the Yuba River. If you wish me to, I will give you the whole thing. I always supposed there was about twelve miles of bottom land from the mouth of the Yuba River up, that was really first class land. I have heard it stated here, that it was ten miles, but I think it is fully twelve miles. I think it is about two and a half miles wide. I followed threshing in eighteen hundred and fifty-eight, eighteen hundred and fifty-nine, and eighteen hundred and sixty, and threshed on almost every farm along the river, and am perfectly familiar with that whole section of country. As to the value of it—it was certainly worth from seventy-five dollars to one hundred dollars an acre. The whole of these orchards and alluvial lands were very valuable; they could not be touched for two hundred dollars an acre, at that time—in eighteen hundred and sixty and eighteen hundred and sixty-one. I suppose they would average about one hundred dollars an acre. The total extent on the Yuba is about nineteen thousand two hundred acres, worth nearly two million dollars.

Mr. Dibble—What time were these orchards lost?

A.—They got the first permanent back-set in eighteen hundred and sixty-two—the Briggs orchard and others.

Q.—Didn't they fill up a long time before that?

A.—No, sir; I was living then right across the road from the orchard.

Q.—I understood you to state that you thought it impossible for the State of California to build levees and confine the waters of these rivers?

A.—Yes, sir; I so state now.

Q.—You think it is more impossible for the State of California to restrain these streams than it is for the State of Louisiana to build levees strong enough to restrain and confine the waters of the great Mississippi?

A.—At the same time, their levees are breaking every year or two. They are now applying to the General Government for the expenditure of millions of dollars in its improvement. These breaks come. We have a bed for our rivers on a level with the country, if not above it. When these breaks occur it empties itself out over us; eventually they will destroy everything. I also have some ideas as to a remedy. I claim that the waters of the State belong to the people of the State, for the use of man and beast, and for navigation. I claim that nobody has any right to use these waters to the detriment of anybody else below them; that it is the duty of the State to make laws, and say how mining shall be carried on. I think they have as much right to control mining as farming. In many ways the State enacts laws governing men's actions, such as putting out poison and other matters. The State has an interest in agriculture as well as in mining. Why not enact laws regulating mining?

Q.—How would you regulate it?

A.—I don't believe it is right for the miner to use the river for a dump, if he can construct any other place for his tailings. I think they should be compelled by law to take care of their washings; that they should not be allowed to throw their water into the streams where it harms their neighbors. I would go on the principle that, while taking care that our washings from our ranches won't go into the river, that they should be compelled to do the same. Mr. Parks has said truly that there are only twenty days in the year that there are any washings from our agricultural land. We can't get ours into the river; our highest land is on the banks of the river, and the washings run back into the basins.

Mr. Ostrom—In your opinion, about what percentage of the debris that gets into the streams comes from the cultivated lands?

A.—I presume that around the bay, where there is considerable hill farming, that there is some little wash from the farms, but when you get this side of the Sacramento, I don't believe it amounts to one part of a thousandth.

Mr. Dibble—I understood you to state that all the waters of the State belonged to the people of the State?

A.—Yes, sir.

Mr. Kercheval—What is the difference now, in summer time, from what it used to be? Does the mining raise the Yuba River, in summer time, any more than if there was no mining?

A.—No, sir; it is so thick it does not run.

Q.—Does the water used in these mines enable steamers to run that otherwise would be unable to navigate?

A.—It certainly does not, according to my judgment and observation.

Mr. Ostrom—You have been engaged in shipping grain down the river?

A.—Yes, sir.

Q.—What is the comparative ease of navigation now to what it was in former years?

A.—Of course in former years I was not familiar with navigation; I was not acquainted with that kind of business; but there was a regular line of steamers, and they carried freight, and had large barges; they got along very well. Now they have to use lighters, the channel being filled up some ten or twelve or fifteen feet. The Feather River is filled up with sand, and spreads out. I suppose there is as much water there as there was before it filled up and spread out and changed its channel. One day the channel is here, and another day it is there.

Q.—Do you know of the General Government having made some improvement in the navigation of the Feather River?

A.—Yes, sir.

Q.—What difference does it make?

A.—No difference whatever, that I can see. They found places where the water was spread out, and wherever it was spread out wider it was shallow. There they built in wing-dams, and it would cure that particular place; but then immediately below, where it spread out again, it would make the same kind of a shoal—it would simply spread out again below. There has been considerable said in regard to using this debris for the purpose of reclaiming the swamp lands. I am of the same opinion as Mr. Parks. In the first place, they can't get it there; and, in the next place, if they could, we don't want it there. They talk about its being a good fertilizer, but it is not. I have no doubt that a little of it run on worthless land would not hurt it; but I would much rather have good land than have the slickens. As far as running it in the tules, to reclaim them, suppose they wanted it there, and suppose they had it there, and these swamp lands were reclaimed by this mining debris, the water would seek its level. It is my judgment that the waters would extend from mountain to mountain—all over the plains generally—because there are no reservoirs to hold it. These tule lands have been formed because there was not sufficient fall in the country to run the water off. If there had been fall enough to carry the water off, the tules would never have been formed. If you will fill them up, you destroy the banks, and if you cant't hold the water that comes between the two levees, it will go just where it pleases.

Mr. Parks—Suppose you take one-half the water out of Feather River and take it into the tules, would not the river fill up faster?

A.—I think it would, sir.

Q.—You could lose the river entirely, by division?
A.—Yes, sir; I think so.

J. H. JEWETT

Sworn and examined.

Mr. Coffey—My occupation is that of a banker. I have lived here in this city since eighteen hundred and fifty; I have resided here continuously all the time. I have not followed the business of banking during the whole time; I have been engaged in different vocations; as early as eighteen hundred and fifty I was packing mules. To give you an idea of the difference of things now and what they were in eighteen hundred and fifty it would probably be as well to describe the difference of things. I came here in February, eighteen hundred and fifty. I found the Yuba River a bright, clear stream, with pebbly bottom, where you could drive a team across in summer time. There were all kinds of fish in the river. I found some of the most beautiful bottom lands I ever saw. A line of boats came up and stopped here. For several years a line of steamers ran here regularly. They brought from three hundred to five hundred tons of freight without any barges. At that time this town had a very great commercial importance. At that time there was some of the most beautiful bottom land in the world here. A man by the name of Briggs started an orchard. He had some very rich land. I recollect that in eighteen hundred and fifty he sold from that piece of land five thousand dollars worth of watermelons in one summer. Then he set out an orchard that was perhaps one of the finest in the State. There were other large ranches on the other side, going still farther up. The land on both sides was as fine land as was ever cultivated in the world. Afterwards the Messrs. Low Brothers planted a piece of land in corn, and I recollect seeing one stalk of that corn that was twenty-three feet high. All that land which I have described is now a perfect desert—worth nothing at all. The Briggs orchard is entirely destroyed, and the trees are covered with sand. They recently undertook to dispose of it by a raffle, but they could not sell the tickets, and it finally fell through, and it could be bought for a song to-day. It is worth nothing at all. These men are all leaving their ranches. Mr. Drum had a very fine ranch, which has all been destroyed. Another man, who died but a few years ago, his ranch is very nearly entirely destroyed. I recollect driving past his place, looking for a place to locate. The horse got into the sand and debris there and came very near going out of sight. This house had to be abandoned and the orchard had to be abandoned, and all the improvements, not only the houses, but fences, and everything else. These farms were actually destroyed. As one consequence of this mining debris, in the flood of eighteen hundred and seventy-four the loss of personal property was not less than half a million dollars here. Before that the water had never been known so high. I had never seen the water so high as to cover any portion of this town in an early day. No ground below E Street was ever covered by water in early days. Now, during the last flood the town was surrounded by a high levee, and the streets were covered with water four and a half feet deep on a level. That I consider to be the direct consequence of the filling up of the streams by this mining debris. In speaking of the damage, these things are actual damage. Yuba County, in consequence of these things, has been left with a heavy debt, and has been struggling and groaning under about five per cent. taxes. She has lost the taxes on that entire property, and so has the State of California, and so they will in the future. That is part of the damages. That seems to me to be about the state of the case, as you will see when you pass over it. Mr. Covello had a very fine place out here, which has been entirely destroyed. He had selected it as being the very best kind of property. Before he died it was a perfect desert. He died about ten or twelve years ago. The upland around his house was all destroyed. I have mined some, but I am not particularly familiar with hydraulic mining. I know what it is from observation.

Q.—You heard the statement of the last witness?

A.—Yes, sir.

Q.—From your own knowledge can you corroborate that statement?

A.—I have no doubt the loss was over two million of dollars in this county. I will give you some idea of the value of real estate. Property that sold for forty thousand dollars in eighteen hundred and fifty-six and eighteen hundred and fifty-seven, to-day could be bought for one thousand. Perhaps that was a high value for it then, but that property cost twenty thousand dollars.

Q.—When did the decline in the values begin?

A.—I think the first decline in value was very greatly owing to the mines being worked out, before the debris came down to any extent. I think the decline commenced as early as eighteen hundred and fifty-eight-nine; then it increased a great deal more rapidly after the debris commenced coming down. There was a time when all these little towns here threw in a large trade to Marysville. It is not entirely owing to the debris; it commenced before that. These banks of the streams don't show the filling of the streams; the banks have filled and built up also. In this same field I spoke of, where this corn was raised, you would have to dig four or five feet to find the posts and fences to-day.

Q.—You heard the questions put to a former witness in regard to the north and south banks of the Yuba River, in regard to the height. We want to know how it was, if the south bank was twenty feet high, that the debris flowed over and covered the land on the south side?

A.—I suppose because the bed of the river has been filled up here.

Mr. Coffey—You say you can't tell anything about the filling up of the river by the height of the banks?

A.—No, sir; not to a certainty. Because at every high water the sand deposited at low water is carried over the banks, and some of it deposited on the banks. The amount of debris, that is the fine stuff, is deposited in summer; it goes over in extreme high water; it don't depend entirely on the filling of the river; every high water leaves a bar higher than it was before. You will find that wherever the water runs that it shoals. If you could put water enough in to make a flume—but whenever the water runs there it will fill up; it runs it over; where the water runs in summer, then it will fill up.

Mr. Ostrom—About how much damage has occurred to the river channel, and the damage in the depreciation of real estate and personal property, and the general property of this city?

A.—That would be a matter of speculative value. My idea is that if this city stood twenty-five feet higher—if it was not subject to overflow—if the river was twenty-five feet lower, that we could depend on a population of fifteen thousand. I know of no reason why we should not have a line of steamers here to-day, except that the rivers are filled up. They run in eighteen hundred and fifty and eighteen hundred and fifty-one, without any barges. Boats as large as any that run on the Sacramento now run here then. I cannot state the exact time when those large boats stopped running that way.

Q.—You have heard the other witnesses testify as to their opinion of the remedy. Have you thought the matter over, or have you any remedy in your mind?

A.—I never formed much of an opinion about a remedy now.

Q.—Have you ever thought of anything besides destroying one of the interests involved?

A.—No. I have supposed, perhaps, that these mines might be worked in some other manner. There are mines rich enough to be worked in some other manner. Then we have a face of a mine, three hundred or four hundred feet high perhaps, more than two hundred and fifty feet of that without a particle of gold that is washed down in order to get at a stratum of gold on the bed-rock. Now, it might not pay to tunnel that. There is no gold in that upper dirt at all, but it is the easiest means of getting rid of it to throw it into the rivers.

Mr. Berry—You have heard several lines of action suggested here. One was that we should have a commission appointed who should have power to employ engineers, and to adopt the plans of the Board of Engineers, and the Legislature to provide means of carrying it out. Another gentlemen says he thinks as far as the Legislature should go in the matter should be to appoint a corps of engineers to examine into the feasibility of the plans. Now, you have stated that you thought the mines could be worked by a different process; that is that they could extract this stratum of pay dirt without removing the top?

A.—It might not pay; I can't tell.

Q.—You think if we should appoint a Board of Engineers to inquire into this matter that they should examine and determine whether or not it is feasible for the miners to work by any other process?

A.—I think they might. I will give you my idea of a plan, and the only one that I believe will ever work. In the first place, nature has provided natural streams and easements for the waters during floods. I don't believe that the waters can ever be carried in channels by levees in times of flood. I don't think the rivers are capable of carrying it. I think instead of having these levees to shut off these natural easements, you would leave them open, you would have no trouble. If you can build reservoirs in the mountains where you can fill up extensive lakes, that would be an excellent idea; that would relieve the river of its floods during high waters.

Mr. Berry—There is a conflict between the farmers and the miners. The farmers complain of the injury done to them by the miners. Now, we occupy the position of legislators, and we want to know whether it is feasible to apply the remedy now, or whether it is proper to restrict the mining interest at all?

A.—I think all the mines should be examined as to the manner in which they shall be worked; I think the commission should examine and determine as to the manner in which the levees should be built, so as not to levee one against the other. As a business man, having a business prestige, I would be very loth about interfering with either interest. I should hate very much to have either interfered with. But as a legislator, working for the interests of the people, I would make it a felony to destroy a single acre of land in any district in the State.

Mr. Coffey—I will ask you how far you would be willing to go. One witness says as far as he would go would be to appoint a commission to inquire into the facts, as a basis for subsequent legislation. Another says he would be in favor of having a commission appointed with full power to find out the remedy and apply it immediately. Now, do I understand you to say that you would have a commision to ascertain the remedy and damages, and there stop?

A.—Yes, sir; I think it would be very doubtful policy to give such absolute powers to a commission. That would have to be considered by the people of the State. It is a grave matter. I think it should be submitted to the people of the State for their consideration. There are men that have lost their whole property. Mr. Drum has lost his whole ranch; he don't want to pay very much for reclaiming it. Suppose one-half of the State is farming and the other half is mining; suppose they work out all the mines and cover us all up with debris—we would have to raise the revenue.

Mr. Parks—I am in favor of appointing a commission and giving them power to apply the remedy whenever they find one. Now, I ask Mr. Jewett whether he is in favor of having that remedy applied as soon as it is ascertained?

A.—I would be in favor of having it applied as soon as it can be done. There is certainly no time to be lost. But I doubt whether I would be in favor of appointing a Board, and having them apply the remedy without any further action. I think it would be giving them a great deal of power.

Mr. Berry—You said a while ago you doubted whether a remedy would ever be found at all or not?

A.—I doubt it very much. I doubt whether mining will ever be stopped at all or not. I don't think it will be stopped.

Mr. Dibble—You stated that you were doing business here in an early day; where did your business come from mostly?

A.—From the mines, principally, at that time.

Q.—Is it not a fact that the mining which was carried on then gave a value to the city?

A.—Yes, sir.

Q.—Is it not a fact that since the construction of the great railroads business has been ruined by them?

A.—Yes, sir; that is so to a great extent.

Q.—How much gold has been taken out of Yuba County at Smartsville and Sutter Flat?

A.—I have no record of how much.

Q.—Twelve millions of dollars would not cover it, would it?

A.—I could not state. At an early day, when the city was so thriving, when we had so much gold, our rivers were not disturbed at all. All the property and wealth was accumulated before the beginning of hydraulic mining. Mining then was carried on without injury to the rivers in any manner. One reason that the railroad took our business away was that the steamers had gone by the board.

Q.—Isn't it a fact that your business with Oroville was taken from you by reason of this railroad at your doors?

A.—No, not necessarily so at all. This was one terminus; Oroville was the other.

Q.—Isn't it a fact that all the trade for the upper portion of the State now passes right by your doors?

A.—Yes, sir; but it is also a fact that if we could have a line of steamers running that would carry from three hundred to five hundred tons of freight, no railroad could compete with them.

Mr. Ostrom—How much benefit would it be to this town if a line of steamers, carrying freight, could run as they used to do?

A.—It would be of invaluable benefit if this town could be the head of navigation. We consider these little steamers of very great advantage in bringing freight here. Our freight would not be more than one dollar and fifty cents per ton on grain if the rivers were as clear as they used to be in eighteen hundred and fifty.

Mr. Dibble—Isn't it a fact that your grain is taken down to the Junction by rail, and then taken up to our place, in Nevada County?

A.—The largest portion of it goes to San Francisco. Very little of it goes to Nevada County.

Mr. Berry—The question was asked you in regard to the probable amount of gold taken out. I will ask you about what percentage of that gold has gone to building up and advancing the prosperity of your town?

A.—Very little, sir. As I told you, our town was larger in eighteen hundred and fifty-three than it is to-day. A large amount of the gold at Smartsville has been taken out since that time. All this property down there on E street you could not buy—you would have to cover it with silver dollars. They asked ten thousand dollars for a piece of land that to-day could be bought for five hundred, with all the improvements on it.

Mr. Berry—Which would be of the greatest advantage, the agricultural lands or the mines?

A.—I presume there is considerable mining trade, but by far the larger interest is the agricultural interest.

Mr. Garver—About how does the agricultural interests compare with the mining interests formerly, when you say this town was so rich?

A.—They were very nearly equal, I think. They are not near equal now. It has been continually increasing. All this land that has been destroyed, if it was reclaimed and as good as it was then, would be worth two hundred dollars an acre.

Q.—Suppose that land was all reclaimed and being farmed to-day, would your interests be anything like as great as they were in early days?

A.—No, sir. I think not; not at large. Our town is growing, and if it was not for the uncertainty with regard to these overflows we would have fifteen thousand people. I think that we have spent about one hundred and thirty thousand dollars building levees, and I suppose we will keep on spending money, and finally, if things keep on in this way, they will break, and the whole country will be overflowed, and then I think we will leave.

Q.—You think it impossible to so construct levees here that they will not at some time or other break?

A.—No, I would not say that. You might make a levee with stone, and build it high enough to keep pace with the filling of the rivers, and carry the debris down. If you put debris in the river it will fill up, and you can't keep it clear; and whenever you have high water you will have your hands full.

Mr. Ostrom—Do you include in your estimate of the loss and depreciation of property the Feather and Bear Rivers?

A.—No, sir, just the Yuba. They are not much better off in Sacramento, because I don't think it is very long before they will be covered up down there. It is my opinion that when a heavy flood comes it will cover up Sacramento. Whenever it rains on the Sacramento River, on the Yuba River, and on the American at the same time, it fills up these rivers, and the water-sheds are so large that it will go right over Sacramento. The only safety is in having it snow in the mountains when it rains down here in the valley. You will find where this bridge is, it has filled thirty-one feet; and at the place where they used to ford the river, it has filled up twenty feet. The river bed has absolutely raised about twenty-five feet. I recollect, in early days, the City Council paid three thousand five hundred dollars to have the bank of the river graded down to the water, so as to cross. The front has been taken out of the store I had there, and the first story was raised ten feet; and the last flood raised the floor about six feet above that.

SUNDAY, February 17th, 1878.

A. B. DIBBLE

Sworn and examined.

Mr. Garver—Go on and state about how much gold has been taken out of the mines in Nevada County, the value of the mines at the present time, the number of people there who live from these mines, etc.

A.—I reside at Grass Valley; Nevada County has been my home for twenty-five years. My occupation is that of a lawyer, and I am also interested in gravel mining. I estimate the population of Nevada County, who depend mainly for support on the mines, directly and indirectly, at about twenty-seven thousand people; quite a large percentage of that number are farmers. I estimate the total yield of gold from the mines of California at a little rising of one thousand millions of dollars. Of that amount I estimate that Nevada, Placer, and a portion of Yuba Counties have produced about one-sixth. It it is my impression that one-third of the gold has not yet been brought to the surface. I think the gold in deposit, lying between Sucker Flat and Snow Point, in Nevada County, a distance of about thirty miles, will exceed the sum of one hundred and fifty millions of dollars. Professor Lore, in the interest of the French Government, made an estimate of that same section, and estimated that it would furnish enough to pay the national debt. Professor Silliman estimated that the same sections would furnish over six hundred millions of dollars. The present developments in that section, in

Nevada County, are of such a character as to induce me to believe that it yet contains one hundred millions of dollars, and probably much more, ready to come to the surface. I am of the opinion that there is a much heavier wash coming from the agricultural lands than has been estimated by any gentleman that has appeared before this committee. Wherever they have mining enterprises they have gardens and lands cultivated for agricultural purposes. These are rolling lands, and a large amount of wash comes from the surface, and is carried off in solution to Sacramento and other points. I would increase the amount of that wash a hundred-fold more than has been mentioned here before this committee. Wherever you find land cultivated in the mountains, this rich, dark soil, during seasons of heavy rain it is carried off to an immense extent. It is my opinion that in the North Bloomfield Mine, where the face is two hundred and fifty feet high, that not to exceed five feet of that face of two hundred and fifty feet ever reaches Marysville. I think it exceedingly important, in the interest of mining and of farming, that they should unite in bringing to bear remedies, which I have no doubt science can present. It is my opinion that a system of levees, properly constructed, and made strong, will protect the farming interests. That all the heavy material will be deposited in the foothills, and the lighter material can be scoured out by the flow of water inside of the levees which can be constructed. I am of the opinion that Marysville could be protected, and should have been protected by our citizens, by constructing a canal above the bridge and running down to Eliza, which, in my judgment, would materially have enhanced the value of property here, and prevented it from decreasing in value, and been a matter of security to the people. Instead of the water turning north and striking the Feather, which is a strong stream, it should have been turned down to unite below the Feather River. I think that would give almost immediate relief. As to the reason why I stated that I thought that in a face two hundred and fifty feet high, only five feet finds its way down, I base my opinion on the fact that the heavy material is held in check, so that in Shady Creek it is one hundred and fifty to two hundred feet deep, while three miles down, it is not twenty feet deep. The same can be said of You Bet, Little Fork, Iowa Hill, Dutch Flat, and Gold Run. I fully agree with the views of Mr. Parks as to the feasibility of security by a levee system, and I am firmly of the opinion that the sooner public attention and act of legislation shall be directed to these matters, the better it will be for the farming interests. The experiment is now being made, looking to the adoption of the drifting system in deep gravel mining. These are experiments which I hope may prove successful. I suppose it is proper for me to state that a large percentage of the water that otherwise would find its way to Marysville to-day, by reason of canals is diverted from its regular channel and, as I understand, is a positive relief to the farmers on the Yuba River, and to the citizens of Marysville. It is being diverted by canals into the cañons in Placer county, and were it not for the fact of these ditches, the flow would be immense at this point. I should place the flow at not less than twenty-five per cent.

Q.—You reason on that in this way—that it is only the loam that comes down here, and not the gravel?

A.—It is not the gravel at all; it is only the loam that comes here.

Mr. Coffey—Would that loam affect injuriously the agricultural lands?

A.—My impression is that if you can hold it and deposit it, it is a great advantage to the land. This matter came more immediately to my attention during the last storm in Nevada County. We have but little gravel mining in Grass Valley, but our streams were full of wash.

Mr. Kercheval—You spoke about the extent of this gravel mining in some of your remarks; now, I would like to know if you can approximate the number of square miles that would be embraced within the radius you speak of.

A.—I am not able to give it exactly. In old times, when this gravel was deposited, the rivers would, perhaps, turn and bend as they do at present, so you can't tell exactly; but the length of the old stream in Nevada County and this county is about thirty-six miles. It may be two thousand feet wide, and it may be but one thousand feet. What is called the Great Blue Channel, that comes down from Plumas County, in our county lies under the surface anywhere from two hundred to four hundred and fifty feet, and the top is as fine black soil as you ever saw, with trees growing on it one hundred and fifty feet high. But you have to go down through sand and gravel before you can strike the bed-rock.

Q.—Can you give us the elevation of this bed-rock above the City of Marysville here?

A.—No, sir; I could not. I suppose the elevation of the bed-rock of the old river channel is nine hundred feet at Moore's Flat.

Q.—What proportion of this is filled?

A.—The line of the bed-rock underlies the surface of the ground that much.

Q.—Now, what proportion of this is of such a character that after disturbing it it would be carried into the streams and down into the valley?

A.—A very small proportion. You take the North Bloomfield Mine and it is a solid bed of gravel from the surface until you get down to the blue gravel.

Q.—This being nine hundred feet elevation above the Yuba River, will not the hydraulic system create an elevation of the bed of the river and make a current to bring this coarser material into the valley?

A.—No, sir. I didn't state that it was nine hundred feet above Marysville. I said the bed-rock of the old river channel at Moore's Flat was that much above the present river current at that point.

Q.—It is susceptible of being filled up. You must have fall enough to carry the material a certain distance where you can dump it into the river or a lower piece of land. Now, to what extent can these channels be filled; to what depth have you fall to carry it?

A.—I am not able to answer that question, except to state that at the income of the flow the channels are well filled now, so much so that at Red Dog, and You Bet, and these places, it is filled up from one hundred and fifty to two hundred feet; that is, the old original channel; it is held there; gravel will not flow away. You can get some fine sand and heavy wash from the agricultural lands, but as for the gravel coming down here, it is impossible.

Q.—There is a question being agitated at Sacramento at citizens' meetings—delegation meetings from the various counties. We have had one meeting of the kind. There is a project on foot and a committee has been drafting a bill to cut canals; to make a cut in the banks of the Sacramento River by which a great portion of the flow of water will be diverted into the low tule lands on the west side. Now, I would like to have you state what effect that will have on the filling of the main channel of the Sacramento River; what effect such a diverson as that would have?

A.—Excuse me when I say I would entirely depend on the opinions of science. I have not sufficient knowledge of the matter to enable me to venture an opinion. I am satisfied that science can afford a remedy. I understand from able men, scientific men, that it can be done. I have no knowledge of it myself. I think that a commission should be had who will give protection to the State and to the interests of all classes, and make it a State matter of taxation, instead of making it class taxation. Our mining property is very valuable; we have to pay our proportion of the taxes. The State is very anxious to have our gold and our products, and it is to the interests of the State that both interests should be protected. I think a State system of levees can be adopted.

Mr. Coffey—You have lived there twenty-five years?

A.—Yes, sir.

Q.—And been a practical miner?

A.—Yes, sir.

Q.—We have asked some questions as to the time this hydraulic mining began; about what time did it begin to assume proportions of great magnitude?

A.—About eighteen hundred and sixty-one; it has been increasing ever since. In eighteen hundred and sixty or eighteen hundred and sixty-one it began to assume these proportions.

Q.—State what kinds of mining there are now in the mountains; how are mines worked there now?

A.—Hydraulic mining, which means to bring an immense stream of water to bear on a bank, washing it away, saving the result in gold.

Q.—Then there are only two kinds—hydraulic mining and quartz mining?

A.—That is all.

Mr. Garver—There are drift mines, are there not?

A.—Yes, sir, but that is merely an experiment. I know of very few of them in that county at this time; there is a large drift mine at Forest City.

Q.—State to the committee what you mean by drift mining?

A.—Drifting out and taking away the face, and going down.

Q.—Is there any way of arriving at the result of this thing other than stopping the mines on the one hand, or else keeping up a system of levees? Is there any other way of developing these mines than by hydraulics, that will bring as good results in developing the mines?

A.—That class of mines that are in such a situation as to be worked profitably by hydraulics cannot be worked to advantage in any other way.

Q.—Were the same mines worked by drifting?

A.—Very few. The Bald Mountain, at Forest City, where they have an underground engine, they drift and carry their stopes—they drift about thirty inches, carry it the surface and wash it when the rains come.

Mr. Kercheval—If the drifting system was resorted to, not disturbing the surface, would there much of this debris come into the valley at all?

A.—No, I think not; I think not very much of it; very little of it would reach the valley.

Q.—The pay portion is gravel?

A.—Yes, sir, mainly, down below.

Q.—If drifting was practicable, the amount that would reach the valley would be so small that no further remedy would be necessary?

A.—No, sir, I disagree with you there; the levee system is necessary under any circumstances. Our agricultural wash alone would fill it up. It is a prevalent idea that there are no farmers in the mountains, but there are a great many, and their farms are on rolling ground, and will wash.

Mr. Ostrom—You say you have a great many farmers there. Have you any idea of the value or the amount of their products annually? Take Nevada County, for instance.

A.—No, sir, I could not give you the figures; the returns of our county are very large, however.

Mr. Coffey—What kind of farming do you do there?

A.—We raise considerable grain; I am inclined to think there is somewhere in the vicinity of fifteen hundred of our population in Grass Valley Township who are engaged in farming; that includes Penn Valley.

Q.—What is your estimate of the products of the soil in Nevada County?

A.—I don't remember the amount.

Mr. Smith—Are you able to state about what the hydraulic mines and water rights are assessed at in that county?

A.—No, sir. I am not able to give the figures. I should take the present value of the mines, and the ditches and water rights, at their present value, at not less than thirty-seven millions of dollars.

Q.—Where do the farms in Nevada County find a market for their produce?

A.—In the mines chiefly.

Q.—Suppose hydraulic mining were discontinued, what would be the effect upon the farming interests and other industrial interests of the county?

A.—Well, farming in the mountains would gradually cease. It would ruin our county. Grass Valley, that is now very nearly as large as Marysville, and where we have a very valuable property, would be of no earthly value to us.

Mr. Berry—Is there any hydraulic mining in Grass Valley?

A.—No, sir, not a great deal there, but we are interested in it. We employ a great many quartz miners at Grass Valley. The hydraulic mining is mainly over on the ridge on the other side, on the north side of the mountains. I don't exaggerate when I say that Nevada County is one solid gravel bed, to an immense extent.

Mr. Ostrom—In your opinion what is the comparative value, assessed value, of all the mining property and other improvements in Nevada County, and the farming, and personal property, and improvements.

A—I suppose the hydraulic mining companies in Nevada County—I could not give you the exact figures—there are companies assessed at two hundred and fifty thousand and three hundred thousand dollars, and I am not certain but some are assessed at more than that. The assessed valuation is not a fair valuation to go upon, for this reason: Take, for instance, the North Bloomfield Mine; they have expended two million five hundred thousand dollars in opening their claim. They have just got to work; in the meantime they have been compelled to employ a large number of men, running tunnels in there, so that the assessed value would not do to go by. I believe it is assessed at three hundred and sixty thousand dollars.

Mr. Kercheval—How many hydrulic mines are there in Nevada County in active operation at this time?

A.—I could not answer that question, sir.

Mr. Garver—The mines are assessed a little like the farmers want their growing crops assessed. You can't tell what they are worth until you get it out.

A.—I have found it to be human nature not to have property assessed at any more than you can help. The mining interest is perhaps ten times greater than that of the farming interests.

Mr. Keyes—You state that by reason of the diversion of water, that the flow is very much diminished?

A.—Yes, sir.

Q.—Wouldn't you be surprised if I should take you down here to the bridge and show you gravel as big as a hen's egg?

A.—No, sir; I am getting too old to be surprised at anything. I doubt your ability to show me gravel as big as a hen's egg, however.

Mr. Ostrom—You spoke about the amount invested in the North Bloomfield Mine, and that they are now at work; I will ask you what that investment is paying?

A.—I don't know, sir. I think the investment is a good one. I think they have in sight millions of dollars that is ready to be poured into the wealth of the State. To what extent it is paying I am unable to state. When a hydraulic company makes a clean-up of twenty-five or thirty thousand dollars a month, it is of great value to the State, notwithstanding it may cause the destruction of land here and in other places.

Q.—Suppose you give your opinion as to the best mode of relief, the best mode of adjusting the differences between the several interests here?

A.—By proper legislation and Congressional action, in the way of the appointment of a commission, to employ the best scientific men to consider the practicability of a levee system and its cost.

Mr. Coffey—You would go no farther at this session than to authorize the appointment of a commission to look into the facts?

A.—Yes, sir, and I would do it at the very earliest moment. I fully agreed with Mr. Berry two years ago, at which time he desired the appointment of scientific men to ascertain the facts. I believe he was of the opinion at that time that it was fully necessary to do it.

Mr. Coffey—Would you go as far as Mr. Parks, and give the commission power to apply the remedy?

A.—I would not hesitate, provided you could be sure of getting a commission that would be faithful to their trust. Assume that fact, and that would be the better course.

Mr. Berry—You stated that in Nevada County you were trying experiments to do away with hydraulic mining; that is, you are trying to see if drifting cannot be substituted?

A.—No, sir; not to do away with the system. They are trying the experiment of drifting because it is absolutely necessary, on account of the immense distance from the surface down to the bed-rock. A face of two hundred and fifty feet is an immense face to wash away.

Q.—You are not experimenting in view of the fact that the present system is doing so much damage?

A.—No, sir; not at all. We are simply making the experiment in view of the fact, that in our deep gravel mines we are compelled to do it.

Q.—You stated that the gravel bed was about thirty-six miles long, and of unknown wealth, etc. Now, what do you think would be the effect on Nevada County if that was all washed out; if the gold was all extracted, and the mines exhausted?

A.—My impression is that my grand children will be better able to answer that question than I am. It will be two or three generations before it is washed out.

Q.—If there were no mines there?

A.—I am of the opinion that a certain portion of Nevada County, the upper portion, is as good land as there is in the State of New Hampshire or Connecticut for agricultural purposes.

Q.—There would be many of the towns that would decay, and your prosperity would cease?

A.—There are twenty thousand people there that would not be there if it was not for the mines.

Q.—That would leave about seven thousand people that maintain themselves on the agricultural lands and interests?

A.—Yes, sir. I would like to add one thing more in reference to this gravel chain thirty-six miles long. That portion—and it is a very small portion that has been worked—in Yuba County, in my judgment, has resulted in the production of twelve or fourteen millions of dollars.

Mr. Ostrom—You spoke of there being twenty-seven thousand people in Nevada County; I understood you to state that there was about twenty-seven thousand people in Nevada County dependent upon the hydraulic mines?

A.—No, sir, not all depending on the hydraulic mines, but who depend upon mining; and a large portion depend on hydraulic mining. But it is not our population that is depending on our mines alone—San Francisco is dependent on them also. I suppose there is forty millions of capital in San Francisco invested in our gold mines; probably more than that.

Q.—About how many employés are there, as near as you can state, now employed in the hydraulic mining business?

A.—I could not answer that. There is one shaft there that I suppose employs an average of thirty men, and each of these men supports probably five. That is only one shaft, and so on all over the country.

Q.—Which is the greatest interest there—hydraulic mining or quartz mining?

A.—Hydraulic mining is the largest interest.

Mr. Parks—You stated that you thought about twenty-five per cent. of the debris came from the agricultural land. I will ask you this question: Suppose that the Courts should grant a permanent injunction against the working of the hydraulic mines within the next ninety days, take the twenty-five per cent. which you assume comes from the agricultural lands, and the debris which is now in the channels of the streams, and in the ravines and cañons—now I want your opinion as to whether a permanent injunction to stop mining would be a remedy, or whether the river would continue to carry off this debris that is lodged in the cañons and the twenty-five per cent. that you assume comes from the agricultural lands?

A.—If you could get an injunction against the flow of water, then you could accomplish that result; but if mining was stopped to-day or to-morrow, the water would continue to carry down mining debris for many years. That is the reason I am so earnest in saying that the levee system, the sooner it is adopted the better it will be for the farming interests.

Q.—What I want is your opinion as to how long the material which is en route now, and lodged in the cañons and streams, would continue to flow down upon us, if mining were entirely stopped.

A.—An injunction against the mines would be no remedy at all. It will continue to flow long after we are gone. So long as the surface is disturbed it will continue to flow. If it be true, as claimed, that the gravel comes down here—and I deny that—if it be true that the gravel will come down here, there is no injunction in the world that can prevent it from flowing, and there is no remedy, except the levee system.

Q.—In early days we worked mines—worked them out, and then abandoned them. I want your opinion as to whether there is any considerable amount of wash from these old works.

A.—There is considerable placer mining. Every ditch that was ever cut, every road, every farm that is being worked on the hills, is sending down surface matter, and will continue to do so.

Q.—Then if the hydraulic mines were stopped, you think it would be no remedy?

A.—That would be no remedy in our lifetime.

HAMILTON SMITH,

Sworn and examined.

Mr. Ostrom—You have stated that there were one or two points in your former examination that were not sufficiently clear.

A.—I wish to give the total production of precious metals in California, from the discovery of gold, as it is compiled by the officers of the government. They put it at a little over one thousand millions of dollars. I think of that sum eight hundred millions have come, directly or indirectly, from the old deposits of gravel. The great bulk of placer gold taken out in early days came from that source. I think that is about the actual yield.

Mr. Coffey—Now, about the interest that San Francisco has in this question, and the amount of capital invested by citizens of San Francisco in the mines: What do you know about that matter?

A.—I have looked into that. I stated on a former examination that it would range all the way from thirty-five millions of dollars to fifty millions. Since then I have concluded that fifty millions is nearer the truth. That estimate is based on the amounts which the several companies with which I am connected have invested.

Q.—What proportion of that amount is contributed by the companies which you represent, or with which you are connected?

A.—From three millions to three and a half millions of dollars. I don't think we represent more than one-fourteenth of the total amount.

Q.—What company are you connected with?

A.—The North Bloomfield Company. I think we took about one million dollars in gold coin this year. Of that, our stocholders in San Francisco will receive about five hundred thousand dollars, and the rest goes for labor and supplies. These supplies are purchased in San Francisco mostly.

Mr. Ostrom—I believe you stated in San Francisco that there was about fifty million dollars of capital represented in the mines from that city?

Q.—And that the whole representative capital in hydraulic mines was about one hundred millions?

A.—I stated from one hundred to one hundred and fifty millions.

Q.—Is there not a large amount of hydraulic mining property owned in foreign countries?

A.—Not a very large amount.

Q.—About how much?

A.—Not more than three or four millions of dollars; perhaps not that much.

Q.—Then about one-half of the hydraulic mining property is owned in San Francisco and foreign countries?

A.—No, sir; there is about two-fifths of it owned in San Francisco. The amount owned in England is not large. About three-fifths are owned in the back counties.

Mr. Kercheval—You stated in San Francisco that you were a civil and hydraulic engineer?

A.—Yes, sir.

Q.—You are familiar with the hydraulic force of water?

A.—Yes, sir. I have made that a special study.

Q.—I presume you understand about the project now about to be entered into in Sacramento, in regard to the diversion of the waters of the Sacramento, in order to relieve the country from overflow?

A.—Yes, sir; I know something of it.

Q.—Now state what your opinion is of the effect of that diversion of the waters on the scouring force of the Sacramento River, and whether or no it would have a tendency to cause a more rapid filling up of the Sacramento River?

A.—It seems to me that the less water runs in the Sacramento River the greater the deposit of sediment will be.

Q.—Give us your opinion as to what you think would be the best mode of relief—whether to divert the water and turn it into canals, or whether to build immense banks on either side; the other is simply an experiment, also. State which you would adopt as between the two.

A.—I would prefer making a special study of the subject before giving any advice in the matter. I think an engineer would prefer making a careful study and survey before venturing an opinion as to the remedy. As far as my opinion goes, however, I think the levee system is by all means the best.

Q.—We are called upon to act immediately by the demands of the people down there. I think it is improper for anything to be done in haste?

A.—It seems to me that it would very injudicious for the State to attempt to take any decisive action before making a careful examination and survey by the best engineers in the State. A canal, even if it succeeded, you might get a large part of the Sacramento River into it. You might get too big a canal. Water is a very difficult thing to manage.

Q.—One of the main plans has been to divert the waters from Gray's Bend. As I understand it the river makes a turn there, and runs up stream, and right there is where this cut is to be made in the banks, so that the water will keep on in a straight course into the canal. The Upper Sacramento, being clear water, I want you to state what the effect would be in the scouring force of the river below, where it comes in contact with the debris?

A.—I think the more you concentrate the water—the larger the volume of water—the better it will scour the channel. As a matter of opinion, I think it would be very difficult to get a very large amount of water through such a canal. It might stop itself up. So, even if the canal were built, it might result in filling that country up without affording any relief. But if the water should go through there in a great volume, it might result in changing the channel of the Sacramento River. In either of these events, it would accomplish no good. The same plan has been suggested as was adopted with the Mississippi River. General Humphreys, the engineer in charge, has said that it is not certain whether the results desired will be accomplished or not. Some of the witnesses seem to think that it is impossible to stem the floods. Well, in other countries they build levees which stand perfectly well, and I don't see why they can't do it here. The levee system is practicable. It is only a question of dollars and cents. It is a question whether it will pay.

Q.—The reason why I ask you these questions is that I wish to fortify myself in the position I took before the meeting of delegates in Sacramento, recently?

A.—In the valley of the Po, which is the most fertile part of the world, the River Po is very nearly as high as the surrounding country. At one place, at high water, it is very nearly forty-five feet high. That is, the surface is forty-five feet above the surrounding country. They are able there to protect that country.

Q.—Do you know anything of the countries by personal observation?

A.—No, sir; but I have read a great deal. The Nile, also, is protected from overflow, and the levees there are over forty feet high.

Mr. Berry—There has been some testimony here in reference to the proportion of sediment in the waters of these rivers, caused by mining and farming. What is your opinion as to the amount of debris in these streams? Mr. Dibble stated that he thought twenty-five per cent. of it came from agricultural lands?

A.—On the Yuba River, that is a matter purely of guess-work. There is considerable comes from the soil, outside of the mines. How much of it comes from that source, is a matter of guess-work. There is quite a considerable, but whether it is twenty-five or ten per cent., I don't know. No man can tell.

Q.—The idea has been conveyed here that the streams would naturally fill up anyway, and that stopping all the mines would not give relief. Now we find the Sacramento, above the Feather, is clear.

You don't see much deposits going on there on account of cutting down timber, building roads, etc.

A.—I have seen the Sacramento River there quite muddy.

Q.—I want your opinion on the point as to whether those deposits, when coming from natural causes, would be injurious?

A.—I think it is the natural tendencies of the mountains to come down to the valleys, and the hand of man assists it in many ways.

Q.—Can you approximate the amount from each cause?

A.—It would depend on the stream. Professor Davidson was correct when he said, as far as the bays were concerned, there is more material comes from the agricultural wash than from other causes. The San Joaquin is as muddy as the Yuba River, and there is no mining on that stream. You can see the wash at San Francisco. At Market and Fourteenth Streets you can see it.

Q.—You have no means of knowing whether the San Joaquin River is filled up or not?

A.—I suppose it is. Our rivers are all gradually filling up. If mining was stopped, it would bring absolute ruin to people living in these upper counties. The people of Grass Valley, though not entirely dependent on gravel mining, still, I think about one-half of the taxable property is hydraulic mining. There is some farming there, but they depend on the mines for a market.

Q.—You heard the statements made before this committee last night, that unless something was done, these rich farming lands would all be covered up and destroyed, and that this city would be covered up and destroyed?

A.—I believe this town can be protected by levees, as well as this entire country below. If hydraulic mining is stopped (and you can't stop it unless you stop quartz mining as well), a large proportion of the quartz debris is fine sand, and that washes down here—you can't stop that part; but if you stop one you must stop the other.

Mr. Ostrom—You give it as your opinion, then, that the only practicable remedy would be a system of levees?

A.—I think that is it; I would not say that there is no other method of relief, but that is my opinion.

Q.—You stated in San Francisco that as far as you would go would be to have a corps of engineers appointed?

A.—Yes, sir; men of ability—impartial men. If you could be perfectly certain that the conclusions they would arrive at would be correct, it would be well enough to give them the necessary power to carry out those plans; but whether it would be wise to delegate such absolute power or not, I do not know.

Q.—Your opinion is that you would only go to the extent of appointing a commission, with power to make a thorough examination?

A.—Well, if I were perfectly certain of the character and wisdom of the commission, I might be in favor of giving them such power. That would depend upon conditions that cannot be ascertained in advance, as to their competency, etc., whether you delegate to them absolute power to apply the remedy or not.

Mr. Kercheval—In appointing such a commission, don't you think it would be absolute folly to appoint any one who had any interest whatever, either in mines or in agriculture, in this State?

A.—I think it would be better to get men who have no interest here, in either mining or farming.

Q.—Through what source would you apply—to the Government of the United States or to the State?

A.—To the Secretary of War.

Q.—And that person should be in no way interested?

A.—No, sir.

Q.—The Government had an Irrigation Commission for a while?

A.—Yes, sir.

Q.—We might have a commission similar to that.

A.—Yes, sir; these men were all able men; I don't think they have any agricultural interest or mining interest.

Q.—Such commissions have generally arrived at satisfactory results?

A.—Yes, sir; I think so. I suppose there is no commission that will satisfy everybody. General Abbott would be an excellent man if he could be had. It may be hard to get men; I don't know. He had charge of the great Mississippi scheme.

Mr. Ostrom—One of our witnesses here last night gave us his views as to how the taxes should be raised for these improvements. We would like to have your views on that matter, as to how funds should be raised to build these levees.

A.—I think to a certain extent the whole State should contribute; I am not prepared to say how far. I think in making up this commission it will be much better to have entirely impartial men in charge of it.

Mr. Parks—Now, assuming that the Legislature will adopt this suggestion, and appoint a commission, who shall have power to carry out the schemes of a Board of competent engineers—now, I ask you if it is not fair to presume that a Board, selected with a special view to their fitness—could not you expect that they would act in good faith? Would it not be safe to rely on their discretion?

A.—Yes, sir; if you got the right sort of men.

Q.—Is it not to be presumed that they will be selected according to their fitness for the position? Is it not a safe place to rest this power?

A.—If the commission should make its report to the Governor, or to the Legislature, then the people would have a chance to criticize it. It is a very grave question. I myself would be satisfied to abide by the decision of such a commission.

Q.—We farmers ain't afraid to meet you half way. We are willing to trust to the Governor to appoint a Board, and will trust to their plans?

A.—Judge Dibble made an estimate of the gold in the old river bed; there are other river beds besides that one channel. I believe the yield of Nevada County in the next two hundred years will be immense.

J. O'BRIEN,

Sworn and examined.

Mr. Ostrom—I have heard the testimony of the other witnesses, and the questions put to them. I have been in Yuba County since eighteen hundred and fifty-three, all the time; I am at the present time engaged in mining and farming both. I am engaged in hydraulic mining, as well as farming. I live in the eastern portion of Smartsville; I have been engaged in farming about eight years; I have been mining about twenty years, much longer than I have farmed.

Mr. Coffey—Go on and state what you know about this matter.

A.—Well, I think the estimates of Mr. Parks about correct. I have examined into that matter some, and I find the number of acres he stated as about correct. I also corroborate his statement as to the damages on the Yuba; also, I agree with him as to the remedy, and the mode of taking care of this debris—levee schemes, building reservoirs in the hills to hold back this water and heavy material. In my judgment it is the only way to get relief from the evil.

Q.—You think the injury has been caused by hydraulic mining, do you?

A.—Yes; the largest portion of it, probably fully eighty per cent. of it has.

Q.—That is a little less than Mr. Ohlyer's estimate, and a little more than Judge Dibble's. When did this damage begin?

A.—Well, hydraulic mining has not been going on as extensively only about fourteen years; in eighteen hundred and sixty-two, I think they began to assume these proportions. Before eighteen hundred and sixty-two, mining was on a very small scale.

Mr. Coffey—Have you made any note of the progress of the damage, of the annual damage since that time, just how it has grown, and how it has increased yearly?

A.—I don't think the damage on the Yuba River has been very much increased since eighteen hundred and sixty-two, since the freshet of that year. That was very high water, and all the country around was overflowed. They had a flood here about two or three years ago. They constructed a bridge across the river, and in doing so there was not room enough left for the waters to pass. I think these levees being built above the town backed the waters up and caused it to raise several feet higher than it would have been had the spaces been greater for the water to pass under. Now they have increased the distance, and I think if there had been as much room for the water to pass under the bridge then as now, I don't think the Yuba River would ever have been as high as it was. I was here at the time, and above the bridge the water must have been two and a half feet higher above the bridge than it was below, showing that this bank, at right angles, had raised the water up and backed it.

Q.—What is the relation of your farming interests to your mining interests?

A.—My interest in mining is much larger than my farming interests; about two-thirds to one-third.

Q.—Has your farming land been affected by this debris?

A.—No, sir. The land that I am farming I am irrigating. It is in the foothills, and we irrigate.

Q.—What do you raise there?

A.—Wheat, clover, barley, and oats, etc.

Q.—Then you say you concur with the opinion of Mr. Parks as to the best mode of relief?

A.—Yes, sir; with the exceptions of where he says who is to pay the expenses. I think the burden of taxation should rest partially on the mines, partially on the farmers, and partially on the State at large. I think the State at large should pay a certain portion of it. The State has a great interest in both these industries, and I would have part of the expense paid by the State at large.

Mr. Kercheval—For instance, if you had a farm and some one located a mining claim above you; your farm is perfectly secure from overflow or any evil effects from the water naturally, but I happen to have a hydraulic mine above you, and in the working of that mine I precipitate my tailings directly on your property and ruin it. Now, if a remedy can be devised by which my tailings can be carried off or kept from flowing on your farm, who should pay the expense?

A.—I think if I dumped my tailings directly on your farm and ruined your property that I should be compelled to take care of them; but I am speaking of a case where we dump our tailings into the river twenty miles above, or in some instances one hundred miles above, and it remains there until the storms bring it down here. I don't think we are any more responsible for that than we would be for a land slide in the mountains. In such cases as you speak of there have been suits brought. I don't know of any at the present time on the Yuba River.

Q.—The reason I ask you that is this: To my mind it matters not whether you can trace it directly to this mine or that mine or not. If these mines all contribute to this debris and throw it into the rivers, it matters not whether or no it is carried down next year or ten years from now, if it does the damage. You dump into these streams and eventually it must be carried on these lands?

A.—Well, there is a great deal of this debris that was deposited twenty years ago, and the men have left the country. For instance, Mr. Jewett testified that he was mining in early days; he was placer mining up in the mountains twenty-five years ago, and some of the dirt is coming down at the present time. It is certain that more or less will come down in high water stages.

Mr. Garver—There has been a statement made here that this water is killing and souring the land. How do you find it; you are using the same water for irrigating?

A.—I cut three crops of clover last year, and raised some wheat.

Q.—What kind of soil was this before you run this debris on it?

A.—It is red land, in some places two or three inches deep. I am raising these crops from debris. If it was not for that water we could not raise the first crop, while we raise three crops now. The alkali desert kills our ground.

Mr. Dibble—I made a statement before the committee this morning as to the amount of gold taken out in that portion of the county, Sucker Flat and vicinity. State to the committee about the amount that has been taken out by hydraulic mines.

A.—I think the amount of money so taken out has been between two and three millions.

Q.—That amount has been taken out and added to the wealth of the State?

A.—Yes, sir; a large amount has been expended in this county.

Q.—From what length of ground of the old Blue Channel was the gold taken?

A.—The old Blue Channel is about three and a half miles east and west, by a mile north and south.

Q.—Have you ever been able to wash down to the bed-rock?

A.—We have a tunnel almost finished, that is about two hundred and eighty feet through. We expect to raise a shaft, and that will open up the channel the whole length of it.

Q.—Do you know the length of that channel, commencing at Smartsville?

A.—About forty-five miles, I think. Some portions of it is three or four miles wide; in some places it is four or five miles wide.

Q.—What is the character of your interest in the mines—an individual interest, or part owner in the company?

A.—I am a part owner in the company—the Excelsior Water and Mining Company. I am a stockholder and the Superintendent.

Mr. Coffey—As a farmer you have an individual interest.?

A.—No, sir. I am farming some individually, but the company is farming on a large scale.

Mr. Keyes—I would like to know what kind of water you use—if you don't purify it before using it?

A.—No, sir; it is the water that is used for miles above us—the water, before we use it, is muddier than it is after it passes through our flumes. It is used for miles above, and it is not purified.

Q.—What time do you use that water?

A.—I commence irrigating in April.

Q.—You don't use it in winter time?

A.—No, sir; we use it five months in the year.

Mr. Smith.—Could not all the water flowing in the Yuba River, in the summer time, be taken out and used to irrigate these foothills?

A.—Yes. My judgment is that it could. I take out the waters of the Yuba, and I tried to organize a company for that purpose; that was before I became a stockholder in the ditch company. Since that time we have as much water as we can take care of.

Q.—How many acres do you intend to irrigate?

A.—I expect in three years to irrigate one thousand five hundred acres. I know other parties who intend to do the same. I intend to irrigate one hundred acres myself individually. Others are doing the same. There are thirty or forty small places along the line of the ditch, and that land was of no value at all until they commenced to irrigate.

Q.—When this system of irrigation is completed, won't that remove from the Yuba a large quantity of this sediment?

A.—It will remove the finer deposits that settle along the river here in summer time. In the summer time the bed of the Yuba raises more than it does in winter, because the water is so low that it will not scour it out.

Q.—It fills up more in summer time?

A.—Yes, sir.

Q.—If you took out all the water in summer it would prevent that filling opposite Marysville?

A.—Yes, sir. I built a levee here two years ago, running from the railroad here to the foothills, seven miles long. I constructed that levee three feet above high water. I came along there in August last, rode along through, and there was about a foot of sediment—this fine deposit—settled along the levee. I rode along there yesterday, and it was not as high as it was last August, because the high water has washed out that fine sediment. There is more of the levee above the level of the water, as I came in town yesterday, than there was last August.

Q.—Are you largely interested in the mercantile business?

A.—Yes, sir; our company spends about two hundred thousand dollars a year. We get all our freight from San Francisco, though it is purchased by Marysville merchants. All our material was brought up by steamer last year, the entire year. We received freight every week during the summer. Last year was about as dry a year as we ever had in California.

Q.—How were the rates on freight last year?

A.—Cheaper than I have ever known it before. We got ours at from three to four dollars a ton on the boat. We used to pay, in eighteen hundred and fifty-nine, from six to twelve dollars a ton.

Q.—So the filling of Feather River has not increased the rates of freight?

A.—No, sir; we got it a great deal less. We got about ten thousand kegs of powder. We got powder up every week during the summer, by water.

Q.—What was your experience in early years in regard to navigation in dry seasons—in September and October?

A.—There were times they had about as much trouble as they did last year. The boats may have been longer than they are now; I don't know about that.

Q.—It has been stated here that Marysville was very prosperous in eighteen hundred and fifty-two and three; to what cause do you attribute the decline?

A.—Well, Marysville was the head of navigation at that time. She furnished supplies for all the northern portion of the State, and all this country here. Since that time Woodland, Yuba City, Oroville, Grass Valley, Nevada City, and all these places have taken a portion of the business away. There were seven or eight lines of stages going out of here, and this was the headquarters of the companies. A large portion of the Washoe travel went by here by stage also, and a large portion of the taxable property of the stage company was here in Marysville, and all their personal property. The railroads have been constructed since, and have taken a large portion of the business away, and there has been some real estate injured by overflow; there are various causes for the decline.

Q.—The mines now, in your neighborhood, purchase directly from San Francisco?

A.—Yes, sir.

Q.—You don't attribute the decline of Marysville wholly to the filling up of the Yuba and Feather Rivers?

A.—No sir, not wholly; I don't think the Yuba River is filled up as much as some people think. I don't think that the low water-mark last year, say in August—I don't think there is over sixteen feet difference between the low water-mark now and in eighteen hundred and sixty.

Q.—You are familiar with the system of reservoirs which the ditch companies have built?

A.—Yes, sir; I helped to construct some of them.

Q.—Did not the water they caught in these reservoirs have considerable effect on the floods?

A.—It certainly has, because for six months in the year there will be water stored up in the North Bloomfield and other mines, water enough stored up so that for six months in the year they will have a supply, say of from twelve thousand to fifteen thousand inches, for six months of the year.

Q.—Will not that supply have a very considerable effect on navigation during dry seasons?

A.—Yes, sir, I think so, because there are from twelve thousand to fifteen thousand inches of water in the river dry seasons; that makes a small river of itself.

Mr. Keyes—Isn't it a fact that these reservoirs constructed in the snow belt are filled by snow water?

A.—Yes, sir.

Q.—Then they don't retain water that actually falls?

A.—When the rain don't reach to the summit we have low water.

Q.—Now you speak about the volume of water being a benefit to navigation. Don't you think it is counteracted by the increased facilities?

A.—I don't think that the water is so thick but what a steamer can travel.

Q.—Isn't it thicker in summer time?

A.—Yes, sir. The cause of that is, there is so much water in these streams now that the water that passes through these flumes has no effect upon it.

Q.—But in summer time you pass nearly all the water through your flumes?

Mr. Kercheval—You state that you got your freight cheaper last year than ever before. Was not this caused by a sharp competition?

A.—Well, the citizens of Marysville have a line of steamers here, and we patronize them for the simple reason that we get our freight cheaper. We used to pay one dollar and twenty cents, where we get the same thing now for seventy cents. We burn from fifteen thousand to twenty thousand kegs of powder every year.

Q.—Don't you know that this last year has been an unusual year for competing lines of steamers?

A.—I don't know about that; but I believe these boats that are running are paying dividends.

Q.—There has never been a season when grain has been shipped so cheaply as it has this year. That was not caused by the citizens of Marysville?

A.—No, sir.

Mr. Berry—Isn't it a fact that they used to use a great deal heavier boats, and that they didn't have to use lighters at all, whereas now they use light boats and barges?

A.—Yes, that is the fact, sir.

Q.—The question of cheap freight by these small boats is no argument against the proposition that the rivers have filled up?

A.—No, sir. I don't deny that the river has filled up.

Q.—You spoke about thirteen million dollars having been taken out up there; in what have you invested any portion of that in Yuba County.

A.—We have spent in Yuba County in driving bed-rock tunnels; we have constructed a ditch exclusively for irrigation at a cost of thirty-six thousand dollars; we have invested about thirty thousand dollars in the purchase of land for the purpose of irrigating; we built a store and carry a stock of about forty thousand dollars; we have built a great many houses for the men who work for us. The taxable property in that township is as much as any other township in this county outside of Marysville. It was all made from the working of the mines there.

Q.—How much has the taxable property increased in that township?

A.—It has increased in the last ten years over two-thirds; I forget the figures.

Q.—Now, you stated that you thought that this wash would continue, and that a large portion of this wash coming down here was from dirt disturbed in eighteen hundred and forty-nine. Now, isn't it a fact that most of the dirt thrown into the cañons in early days still remains there, and has been covered up by the recent deposits from forty to one hundred feet?

A.—Yes, sir; but all the debris was not in the river; there are a thousand tributaries to the Yuba River. You may mine up there in these ravines with a rocker, and these snow slides will bring it down here. That is the reason I approve of Mr. Parks' theory of building reservoirs in the mountains to hold back a portion of this. Take Shady Creek, about thirty miles from here. For about five miles long, the tailings have filled about one hundred feet deep, and there has not been any mining there for the past ten years. All these places where there has been no mining for ten years, the tailings are there, and they are going to find their way down here if they are not stopped. Shady Creek is a snow stream, and there is a large watershed. Of course, during high water a great many of these tailings come down and find their way into the Yuba River.

Mr. Kercheval—You say you approve of Mr. Parks' plan, creating dams to hold it back?

A.—Yes, sir.

Q.—Now, if you miners approve of that, is it necessary to have any legislation on it at all?

A.—Yes, to take care of what has already been done. But you ask us to go and take care of what has been done years ago. I think the most you can ask us to do is to take care of the damage we are going to do ourselves.

Q.—You speak of running a tunnel through the bed-rock; what is the idea of running this tunnel?

A.—To put a flume in and run off the gravel.

Q.—Have you washed out all you can without this flume?

A.—We have not disturbed any portion of this ground; it is a portion of the claim that has never been worked.

Q.—You know what you will do?

A.—Yes, sir; we will get below the bed-rock, and then work upward.

Q.—What amount of material—increased amount of material—are you going to throw into these rivers, over and above what you have before, when you reach this ground you are running for now?

A.—I expect the amount will be increased. There are three hundred and sixty acres, and the depth of that will be two hundred and fifty feet, and we expect to work it all.

Q.—Then, what amount will you increase the deposits, and what effect is it going to have upon this country?

A.—That would not affect it much; that is not a drop in the bucket to what is going on on the Yuba.

Q.—Your ground will vary from one to five miles wide?

A.—There is a very small percentage of that material finds its way down. It is coarse gravel and bowlders. Two hundred and forty-eight feet of it is solid gravel and stone. There may be two feet of it surface material. Really there is very little of that finds its way down here.

Q.—Have you room there to deposit all this material?

A.—Yes, we have the room. The gravel bed does not extend all the way along; there are breaks in it. We have it three and a half miles long by a mile wide; then we go down across the South Yuba before we strike any more gravel. That bed runs along a distance of thirty-five miles, may be more—from one to five miles wide. There are breaks in that also.

Mr. Parks—Is it your opinion that the Legislature should provide for a commission, and give them power to apply the remedy?

A.—I said I concurred in your views, and that includes all that.

Mr. Smith—I would like to state a couple of facts. I have had a great deal to do with these reservoirs, and have constructed the dams for several of them, and am familiar with them. Every one of these reservoirs will fill at times of great flood; at the time the flood is at its greatest height. So that every foot of water that is held back will have a tendency to decrease the quantity of water in the rivers passing Marysville. Then there is another thing: It has been said that the Yuba River is one-fourteenth solid matter. I have made careful estimates as to the amount of wash, and I find that it takes twenty feet of water to move one foot of dirt. At the Smartsville Mine I have made careful examinations, and it takes thirty-five feet of water to move one foot of ground. So that the water running right in their flumes is only one thirty-fifth solid matter, right there at the mines.

Q.—Mr. O'Brien, I think there is some mistake in your testimony. I want to know whether in the future you will wash any more gravel into the rivers than you have in the past?

A.—No, sir, not as much, because the surface is already washed off, and we are washing heavy deposits with the same water we have been using on mines that we are not going to work. The grade of the new tunnel is five to twelve, and the old was two to twelve. You can run one-quarter more earth through it. This new tunnel is to replace the ground that is all worked out.

Q.—Don't you think that is the case all the way up in the mines?

A.—I think it is the case with all the mines I am acquainted with; they are working with less grade now than they did in old times, and the surface is, to a great extent, worked off, and they are working the heavier material.

Q.—Will not the larger portion remain in the gulches on the Yuba?

A.—Yes, sir.

Q.—Will not these large bowlders form dams in the cañons and catch this debris?

A.—Yes, sir; they have done so, and will continue to do so. The river there has filled up a great deal more than it has here.

Mr. Kercheval—Will not that increase the grade so that as your washings increase it will throw the heavy bowlders farther down?

A.—The increase of the grade will also increase the width of the river, so that it don't have the same force that it did before. It is now about two thousand feet wide, and as we raise the grade the width still keeps increasing. The stuff lodges more easily now than it did before.

Q.—How high is the mouth of the new tunnel above the fill?

A.—The mouth of the new tunnel is about one hundred and forty feet above the present fill. We have that much to fill up.

Q.—Will that eventually fill clear up to the mouth of the tunnel?

A.—No; this tunnel dumps into Deer Creek. It don't fill into the main river at all. It will deposit the debris into Deer Creek, and some of the lighter material will find its way into the Yuba River.

Mr. Smith—I would like to know how much—whether the cañons on the Yuba River and its tributaries, whether they are not large enough to hold all the gravel that may be washed into it?

A.—Well, I suppose the cañons on the Yuba River are increasing every year in width as the tailings raise the bed. When I first went there, starting at Rose Bar you could not travel along the river. There were high falls in the river, twenty to forty feet in places. It is a regular grade, now, clear down, and no falls, and in some places there the river is two thousand feet wide. All this heavy material remains there.

Q.—Is that filling increasing—is the width increasing?

A.—Yes, sir. A great deal of the surface soil that comes down now comes down from the banks of the river. As the tailings raise the water raises, and that washes off the surface into the streams, and that finds its way down into the rivers.

Q.—Do you know what the fall of the river is?

A.—Yes, sir; the fall from our place to Bridgeport is about ten feet to the mile. I think from Rose Bar to Bridgeport is about twelve miles. From our place to Ousley's Bar is about eight feet to the mile, and from Ousley's Bar to the Yuba Ranch is about seven feet to the mile, in the present channel of the river.

Mr. Berry—You say this filling that has taken place there is all this heavy material that don't wash down?

A.—Yes, sir.

Q.—What is your opinion, then, if you were to discharge this material into the river—would it not wash down?

A.—The fine portions might. Every year this sediment, which we throw in there, forms in hard chunks; take this blue cement and it is hard.

Q.—You think the bowlders would form a kind of a pavement in the bed of the stream?

A.—That is the case now.

Q.—You don't think the river will ever clean itself out to its original channel?

A.—No, sir; not above us. Up in the cañons it won't.

J. C. SMITH,

Sworn and examined:

I have been present and have heard the testimony and questions. I came to the State in eighteen hundred and forty-nine, and came to Marysville in eighteen hundred and fifty-one. I settled in eighteen hundred and fifty-one at the same place where I am now. It is four miles south from Marysville. I am familiar with both the Feather and Yuba Rivers. I think I can give you some facts. I came to Marysville in July, eighteen hundred and fifty-three. A boat was running to Marysville. I sold these boats some wood on the Yuba side. At low stages of water they had no trouble here. I don't know the tonnage they carried—seven hundred or eight hundred tons. Afterwards, when the water went down lower, a little stern wheel steamer—the Governor Dana—was here for a number of years. She used to make daily trips, bringing passengers and freight. I think the Governor Dana left here in eighteen hundred and sixty-nine or eighteen hundred and seventy. This sediment at our place, about in eighteen hundred and sixty-one and two, we found it of considerable benefit. Since that, the last five or six floods, it poisons the land so that it will not recover for three or four years. I can go next May, when the wheat heads out, and show you within two feet where the water has covered it, by the condition of the grain. Now they say the Feather River has not filled up. In eighteen hundred and fifty-five there was a camp-meeting held a mile and a half above the mouth of the Yuba, and on ground on which the water stood at the lowest stage last year, and my recollection is that the meeting was held the fifteenth of June, and there was no water on it then. That is above the mouth of the Yuba. In eighteen hundred and sixty I helped to clear out ground on the Feather River, about three miles below the mouth of the Yuba River, where they raised all kinds of corn and vegetables. The water at its lowest stage was four feet. There were no deposits on the ground. To-day, down at General Sutter's old orchard, there are orchards with water all around the trees. It has been abandoned entirely. General Sutter commenced to put out that orchard about eighteen hundred and fifty-one. He had then lived there four or five years. Then there is the Hobb farm. About at the same ratio the river has filled up there also, according to my recollection, from fifteen feet. Right here at the mouth of the Yuba I have forded the Feather River and hauled hay across it.

Mr. Coffey—You heard the statement of Mr. Drum?

A.—Yes, sir; I heard it.

Q.—That was mostly as to the Yuba River?

A.—Yes, sir. I agree with him in every particular. I think, from my recollection, he makes a little higher estimate of the quantity of land destroyed than I would do. He don't put a bit higher valuation on it than I should. There are two of us in our place. We have about one hundred and fifty acres of alfalfa; that pays three or four times as much as wheat. Three-fourths of the Yuba bottoms was the best quality of alfalfa land. Even before these bottom lands were destroyed, San Francisco got a large amount of fruit from Marysville. Take my own land—I have raised squashes that weighed one hundred and seventy pounds. To-day, on that same land, there is neither deposit nor wash, because it is carried off; but the fact of that water being there, it has grown to salt grass, and we would have trouble to get it off. It is destroyed from that cause.

Q.—You heard the statement of Mr. Ohlyer as to the Feather River, as to its filling up; how as to the destruction of property—is there anything in your knowledge by which you can corroborate his statement?

A.—I think every estimate that has been made is too low. There is plenty of land in the State that pays heavier freight on their produce than we do; labor is higher, their climate is no better, and yet their land is valued a great deal higher than ours. The only reason of it is the doubt we live in.

Q.—Do you agree with Mr. Jewett?

A.—Well, I am not in favor of giving up as soon as he does; I believe in working until we die. Still, if this goes on, in twenty years from now the country will be a desert from here to Sacramento.

Q.—Then, after all, you believe that in the course of time the destruction will be total?

A.—Yes, sir; there is no doubt of it.

Q.—You have heard the statements of Messrs. Parks, Ohlyer, and others about methods of relief?

A.—My judgment is that the only method of relief would be to depend upon levees, and that is only a partial relief. To keep the waters in the channel—that is the only relief I can see, and that is only temporary. Whenever we get above the main banks, and whenever we have no channel below, the levees will give way, because the water rises so sudden.

Q.—Then you think there is no way of constructing a levee that will resist the ravages of the water?

A.—Only for a few more years; ten or fifteen years at most.

Mr. Ostrom—About the channel of Feather River; about what percentage of the channel has been filled up?

A.—Right here at Yuba City it has filled up twenty feet; may be one-half is filled up now; that is, taking the highest banks. We have certain banks that the water has never been over. We have others that the water has been over from three or four inches to five or six feet.

Q.—Are you acquainted with the Feather River farther down?

A.—Yes, sir; but not very familiar, except about six miles.

Q.—Will the same thing hold good all the way?

A.—Yes; to a certain extent. In eighteen hundred and fifty-two and three we had a succession of floods. On the land I live on the water never went through there but once, and that was in eighteen hundred and fifty-five, and then it was only about two feet deep, until the flood of December, eighteen hundred and sixty-one. In eighteen hundred and sixty-five, in the spring of the year, from the melting of the snow, the water started out of the river on this same red land that goes through my place, but didn't reach us. In eighteen hundred and sixty-six it ran through and covered one hundred acres for us. That was from the melting of the snow in the spring. In eighteen hundred and sixty-seven it did so again. In eighteen hundred and sixty-eight the same thing occurred. In eighteen hundred and sixty-nine we built the levees. There has never been a year since that time that it would not have done the same thing in April or May, had it not been for the levees. It did it once in nine years, in early days, and only once.

Mr. Berry—You attribute that to the filling up of the river?

A.—That is the only cause I ever heard of.

Q.—Would the water be running through there to-day if it were not for the levee?

A.—It would be running through about a foot or more than at our low water-mark last fall. Whatever the river raised above that point would run through if it was not for the levees we have there.

Q.—You stated a while ago that you would rather have the river as it was, without any filling, and have no levees, than to have it as it is now, and have your levees?

A.—Yes, sir; I would feel safer.

Q.—On an average how high is that levee?

A.—It is about sixteen miles long, and about twenty-five feet high. I never measured it; that is only guess-work.

Q.—It would make an average of twelve feet?

A.—Yes, all of that. We increased the banks more than that; yet we don't feel as safe as we did before. We feel as though we were living along there, liable at any time to be swept out. If the levee breaks it will run over us.

Q.—The bed of the river has increased equal to the height of the levees?

A.—Yes, sir, one-half more; I know that to be a fact. That is, on my own land, on Feather River. I have landmarks also outside of that from which I judge.

Mr. Kercheval—When does the greatest amount of fill occur?

A.—In the summer time. With such a stage of water as we have now I don't think it will increase but very little, only where it forms a bar. But in the main channel, my impression is that the pressure of water takes it below. When it is low the Yuba River is about one-fourteenth solid matter. That is owing to the season.

Q.—Have you ever tested that?

A.—Yes, sir. I have taken a bucket that was fifteen inches deep, and dipped it up any time in July or August, give it a chance to settle, and one-fourteenth of it will be solid matter. That is the nature of the loam in it. That is not sand; it is dissolved earth. There is some sand in it. After it is dry you take and rub it up in your hand and you will see that there are particles of sand in it, and slickens.

Q.—You have heard the testimony as to diverting the waters of these rivers into canals; do you agree with the other witnesses that the diversion of the waters into canals would have a tendency to cause the rivers to fill up faster?

A.—Yes, sir. I think that all we want is to turn our high waters out of the rivers and let them find a channel elsewhere, and then we may get ready and leave. It would be the greatest possible injury that could be done; it would cause the beds of the rivers to fill. I think if they had been diverted this year it would have been a present relief; but in a few years these tule land would be filled up, and then the beds of the rivers would fill up that much faster.

Q.—I will ask you your opinion as to the best mode of relief for this injury?

A.—I don't believe there is any mode of relief that can be applied in the world without stopping it. Stop the hydraulic mines for ten or fifteen years and you might remedy it. The drift mines are only a drop in the bucket. I think in a few years the property holders of the bay will be perfectly willing to sacrifice their interest in the hydraulic mines for the purpose of saving their property in the city.

Q.—You mean that in the course of time the harbor will be destroyed?

A.—Yes, sir. I think, in the course of twenty years, there will be only channels here and there in the bay. Even stop it to-day, and I think the quantity that will go down and find its way to the bay will be of very great injury to the harbor. It is merely a matter of cubic yards.

Q.—You disagree with Mr. Parks on that question?

A.—Yes, sir, I most certainly do.

Mr. Ostrom—Could you give this committee any advice as to the best mode of action, other than the one you have spoken of?

A.—No, sir; no way in the world. I think there should be a commission appointed by this Legislature; and I think if we have no law by which hydraulic mining can be stopped, that one should be enacted. I think the present Legislature should pass a law that would act in such a way that would preserve the country from destruction. It is just as plain as can be.

Mr. Parks—As I understand you, you think the remedy should be applied at once?

A.—Yes, sir.

Q.—Now, I will ask you this: Assuming that the Courts would grant an injunction, and the Legislature should pass an Act prohibiting hydraulic mining from this time on, whether there would be any necessity of any farther action?

A.—Yes, sir; that would not give us immediate relief.

Q.—The levee system, or some other plan, is an absolute necessity?

A.—Yes, sir, to levee now is an absolute necessity. But it is only a relief, according to my judgment, for a time; it will not be permanent, if mining is not stopped. Had it not been for the encroachments of this mining debris, leveeing would never have been necessary here.

T. B. HULL,

Sworn and examined.

I am a farmer by occupation; I reside in Sutter County. I have followed farming since eighteen hundred and sixty—seventeen or eighteen years continuously.

Mr. Coffey—Go on and state to this committee your opinion. You are acquainted with the amount of land covered by this debris here. What is the extent of the damage, and the cause, etc.?

A.—My experience is, that since eighteen hundred and sixty, eighteen hundred and sixty-one, eighteen hundred and sixty-two, that the bottom lands on the Feather River, from Yuba City to Nicolaus, have been ruined by reason of the mining debris and the use of the mines, and rendered entirely worthless, comparatively. In eighteen hundred and sixty-seven we lived on that side of the river, recognizing the fact that it would be no use trying to keep these bottom lands; the levees of District Number One were built outside of the bottom lands. We recognized the fact that it was of no use trying to save that portion of the Feather River bottoms. At that time, we built a levee over three miles above Yuba City, a distance of about eighteen miles, in District Number One, and we have kept it up since that time at great expense. That is the district spoken of by Parks and Ohlyer; I farm within that district.

Q.—You have heard the statements of the witnesses before you. State to the committee whether you agree with Mr. Parks and Mr. Ohlyer.

A.—I agree with them as to the damages, and as to the valuation of the property, so far as I am acquainted with it.

Q.—What do you say about the Feather River?

A.—Well, from Yuba City to about three or four miles above Nicolaus I don't think the main channel is filled more than six or eight feet, though there is a great deal of sand and debris deposited in the channel of the stream, but the actual filling of the channel I don't think will amount to more than six or eight feet.

Q.—As to the filling of Feather River, take the whole channel and average it, what proportion has been filled?

A.—I think one-half of the channel is filled already. My experience in regard to levees has been that whenever we have kept the levees without breaking, for the past six or eight years, the channel has not filled so much as it has where they have no levees. As soon as the water has been discharged, through breaks in the levees, the river below the break fills up with sediment, and deposits very fast.

Mr. Ostrom—What is your opinion in regard to leveeing these streams, or any other way to keep out of the difficulty?

A.—My opinion in regard to leveeing for our own protection, whether it be only temporary or not—it is the only way of protection—is to keep the levees up. If we let them go down, we will be immediately submerged by mining debris.

Q.—Do you think it would be a permanent relief to have a system of levees as spoken of here? What do you think of the scheme?

A.—I am very doubtful whether it would be a permanent relief with the amount of debris coming down into the rivers at the same rate, unless the heavier part of it could be retained in the mountains and cañons.

Q.—What do you think about remedying the matter by levees, or any other remedy which you can state? Give us your judgment as to any practical remedy which you can think of; also as to the question of appointing a commission and the power to be conferred upon them?

A.—Well, I think the Legislature should immediately appoint a commission with power to act as soon practicable.

Q.—How much power would you be willing to give them? How far would you be willing to go?

A.—Well, I would be willing to go as far as this: That when the commission arrive at a solution of the problem, a special session of the Legislature shall be called to take the matter into consideration, and not to delay action on it until another regular session of the Legislature. I think the interests involved demands such action by the State.

Q.—Do you agree with Mr. Parks' opinion on that? As to giving the commission full power to act?

A.—Well, I believe I do. It would be better for the agricultural interests, and I believe better also for the mining interests, that the commission should have power to act, rather than to stave off action for some future time.

Q.—Does your knowledge extend to the eastern side of Feather—or what knowledge have you as to that country over there?

A.—I am not so well acquainted with the eastern side as with the western side. On the west side the bottom lands are filled up from two to ten feet. I estimated that the bottom land will average half a mile wide all the way from Yuba City to Nicolaus.

Q.—The statement was made last night as to the value of these high lands, which would seem to convey the idea that they are not very valuable; what is your estimate of the value of these high lands, close to the bottom lands along the Feather River, on both sides?

A.—The high lands on the west side of the Feather River will average forty dollars an acre now.

Q.—If you could rid yourselves of this dirt and debris, what would that land be worth?

A.—It would add fifty per cent. to the value of these lands.

Mr. Berry—About this commission; what would be your idea in reference to raising the money to carry out this plan you would be willing to have adopted? Is it your idea to raise the money from the State, or from the mines, or by what means? In what way—it might make a very material difference. You say you are in favor of having a commission to act as soon as they can adopt a plan?

A.—A part of the money should be donated by the State at large. It is to the interest of the State that the agricultural interests should not suffer, and that the mining interests should not suffer. I think it is right that the State should help protect them. As to the lands that might be reclaimed, I think they should pay a certain portion of the taxes. I also think the hydraulic mines in particular should pay a certain portion of the taxes, as they cause the damage.

Q.—What do you think about the scheme of diverting the waters into the tules?

A.—I don't think it will afford any relief whatever. Only for a short time, anyway.

Q.—Have you any idea what proportion of the expense you would be willing to have the agriculturists pay—what percentage of the cost?

A.—I don't think I am prepared to say.

Q.—Well, your reasons for the State paying a portion of the tax is that it is to the general interest of the State should not be crippled, and that mining should not be crippled, and hence the State should bear a portion of the burden, and I would like to get an idea of the proportion you would be willing to pay?

A.—I am not prepared to say now what proportion would be right. As a matter of right and justice, the agricultural portion of the State should not be taxed for taking care of this debris. If a man washes his debris down on your farm, and destroys it, he should be compelled to pay you for it. But if you can't get a whole loaf, you had better take half a one.

Mr. Dibble—In what manner would it be possible to obtain compensation from the miners for damages done, without knowing who the parties were. How would you do it?

A.—I suppose that would be one of the duties of the commission to ascertain that fact.

Q.—How would you propose to collect it from the miners, when you can't distribute the damage done. In what manner would you collect it?

A.—I would leave that to the commission, to ascertain the amount and the just proportion.

Q.—There are, perhaps, five thousand miners in Nevada County. How would you propose for the Legislature to fix the amount that should be paid by John Doe and other miners composing the different companies?

A.—I don't know how it would be done. I don't know that I am prepared to give my opinion as to how this matter should be fixed. I mean a general tax on the State, and a special tax on the mines and on the swamp lands interested, by an assessment levy, and all the mines and all the swamp lands that are reclaimed by it. That would be the only plan I could suggest.

JOHN SEWARD,

Sworn and examined.

I am a farmer by occupation; I have been engaged in farming since eighteen hundred and fifty-one, farming on Bear River, Yuba County. I have farmed some land in Sutter County, also. I can go back and tell the committee what has taken place in my vicinity. I started there on Bear River in eighteen hundred and fifty-one. The bottom lands proper on that river were from half a mile to a mile wide. Since that time these lands have been covered, on an average, probably fifteen feet deep. Those bottom lands were considered the most valuable lands in that vicinity. It was the richest soil you would ever see in any country.

Mr. Ostrom—About what would such lands be worth at that time?

A.—If it was free from sediment, I would place a very high value on it—from one hundred and fifty to two hundred dollars an acre for the bottom lands proper. It was black bottom land.

Q.—About how much, in your opinion, has been covered by this debris of those bottom lands? About how much land was there originally?

A.—The bottom lands on that river were not so extensive as they are now. The lands that we considered then as uplands being filled up, we consider the adjoining lands as bottom lands. The channel of the river has been filled up completely. Between Bear River and Dry Creek there is probably three thousand acres that it is not safe to crop at all, and there is but little sediment in it; but the water comes over it in high floods and destroys the crops. That land is valuable. It would be worth fifty dollars an acre if it was free from floods. I have seen crops almost ready to harvest in May, that would have yielded from thirty-five to forty bushels of wheat to the acre; I have seen the spring floods entirely destroy the crops.

Q.—Provided this debris could be stopped, would that land that you say is covered fifteen feet deep ever become valuable?

A.—That has never been tested. I don't know. Perhaps in years to come, by cultivation, it might become fertile.

Q.—Can you approximate the whole amount of this better class of land on the Bear River, from the foothills to the junction, that has been destroyed?

A.—Well, the bottom land proper is from half a mile to a mile and a half wide; I have never figured up what the total amount would be; that is all destroyed entirely; that is all grown up to willows; it is covered with sand and slickens.

Q.—What is your opinion in regard to the mode of relief?

A.—That is a difficult subject to grapple with; if the waters could be confined between levees that would afford relief. But if we have big floods it is very doubtful whether levees will confine the waters at all.

Q.—You still own land adjoining this bottom land?

A.—Yes, sir; much of it subject to floods; I don't propose to try to raise grain on it; I use it for pasture; and where the water goes over it, it leaves it covered with mud.

Q.—How long will it be that any of this second class land, or any of the land adjacent to the better class of lands—how long are they secure?

A.—It is only a question of time when they will all be ruined. The debris is working back on it, and it is only a question of time when it will be destroyed, the same as the bottom lands have been.

Q.—About how much is that land worth in your vicinity?

A.—This land along the Feather River, for two miles east of the Feather, is worth fifty dollars an acre, and much of it more than that. That is a space of about five miles from Bear River to Dry Creek.

Q.—You have heard this commission spoken of; what is your opinion in regard to that, if you have formed any opinion?

A.—I think these matters can't be investigated too soon, and it should be had at the earliest moment.

Q.—What do you think of the views of the other gentlemen you have heard here?

A.—Well, in regard to that, I can see no solution now except in the building of levees. That, I think, would be a temporary relief. It must be so. Judging from the past, the way the rivers fill up, I haven't a doubt, if we should have such a flood as we had in eighteen hundred and sixty-two, it would destroy Sacramento.

Q.—I will ask you, about what the damages have been to this Bear River country, in the way of losses of lands, improvements, and the losses of taxable property by this destruction, including the whole?

A.—Well, I am not able to answer that question.

Mr. Smith—I will ask you one question: Was not the most of this damage to these rich bottom lands done in eighteen hundred and sixty-two?

A.—At my place, in eighteen hundred and sixty-two, there was about two feet of sediment settled over my place. At that time we cut two or three tons of hay to the acre.

CLAUDE CHANEY,

Sworn and examined.

I live in Wheatland, Yuba County. I came to this country in the fall of eighteen hundred and forty-six. I have lived there pretty near all the time. When I came there these rivers were deep, clear streams. They remained so until eighteen hundred and sixty. Up at my house the river was eighteen feet deep and not over one hundred yards wide. At that time I owned a valuable ranch in there. That ranch now is entirely covered up with sand and gravel, entirely destroyed. Opposite where I live it is probably from twenty to twenty-five feet deep in the river.

Mr. Ostrom—What was the nature of your business in there?

A.—I had a farm and vineyard.

Q.—Before this change came what was the extent of your property there, and the probable value of it?

A.—It was first class wheat land, and besides that it was first class orchard and vineyard land. It was worth one hundred dollars an acre. I had last year four hundred acres of destroyed land, which is not worth anything now; I don't suppose anybody would give fifty cents an acre now for it.

Q.—Do you know about how many acres of this bottom land there were from the foothills to Feather River?

A.—Well, I could not estimate it exactly. It was a strip about one mile wide, on an average, and fourteen miles long.

Mr. Smith—Most of this damage, you say, was done in eighteen hundred and sixty-one, or in the flood of eighteen hundred and sixty-two?

A.—The damage has been going on from eighteen hundred and sixty-one up until three years ago.

Q.—Haven't you sold that land?

A.—I sold it to the Savings Bank of San Francisco.

Mr. Kercheval—What time was the ranch entirely destroyed?

A.—In eighteen hundred and seventy-five; on the nineteenth of January, eighteen hundred and seventy-five.

P. E. DRESHER,

Sworn and examined.

My occupation has been that of a farmer and surveyor together. My residence is Nicolaus, Sutter County. I have resided there since eighteen hundred and forty-nine.

Mr. Ostrom—You have been familiar and are acquainted with that portion of the country. I would like to have you state in regard to the particular matters we are investigating. You have heard the witnesses making their statements?

A.—I have just arrived here, and haven't heard but one or two witnesses.

Q.—You are a surveyor?

A.—Yes, sir.

Q.—Now, I will ask you in regard to the damage that has occurred from this debris—the amount of land damaged, the probable loss of personal property and improvements?

A.—The damage, as far as my personal knowledge is concerned, on Bear River—I can speak positive of my personal knowledge; but on the Yuba River I don't know. I would corroborate the statements made here. There was a slip of bottom land that was valued in eighteen hundred and fifty-eight and eighteen hundred and fifty-nine at fifty dollars an acre. Some of it was sold for sixty dollars an acre in eighteen hundred and fifty-nine—a strip a mile or a mile and a half wide. There was a strip on the south side of the river about eight miles long by about half a mile wide, or a mile. On the north side it was, perhaps, only four or five miles long, and about the same width as the other. That was the bottom land. On the other side there was a levee and that was not damaged by the floods. That has been preserved by levees.

Q.—What was the loss in improvements, orchards, buildings, etc.?

A.—I think they would amount to one hundred and fifty thousand dollars.

Q.—How much loss in assessable property has there been, to take the whole damage that has occurred in that immediate section now spoken of, since the time it first commenced; about how much would the damage be if assessed in the condition it would naturally be in but for these overflows?

A.—I think four hundred thousand dollars would not cover the loss in assessable property in that section of country alone.

Mr. Kercheval—That would be the assessed value, or the full value, which?

A.—Property is not assessed as high as it is worth.

Q.—In regard to Feather River—you are intimately acquainted with Feather River?

A.—Yes, sir.

Q.—Give us any dates in regard to the damage above and below you there?

A.—On Feather River we have so far, on the east side, protected ourselves by expensive levees.

Q.—Has Feather River filled up to any extent; if so, give us the average clear across; about how much?

A.—At Nicolaus it has filled; the bed has raised six feet—the average bed. The bed of the Feather River in eighteen hundred and forty-nine was composed of hills and ponds. There were places where it was twelve feet deep, and others where it was only three feet deep. All these high places have filled up six feet and the holes have filled up also, and that would make eighteen feet. But the carrying capacity of the river has filled up six feet.

Q.—In regard to the navigation of Feather River, what is the comparative ease of navigation on that river now and formerly?

A.—The bed of the river has filled up with gravel six feet deep, and this coarse gravel; of course the water runs through it and a great deal of water is lost. Formerly the bottom was of clay; now there is six feet filled with gravel. The water runs through that, and in low water there is not as much running on top as there was when the bottom was of clay. If this filling continues, the river might sometimes in the summer time lose itself in the sand entirely. That would be according to the rate it has been filling up.

Q.—Tell us, if you know, the difference in the tide on the Sacramento in eighteen hundred and fifty, and down to the present time, from year to year, and the cause of that difference, the force of the current, etc.?

A.—The tide in eighteen hundred and forty-nine rose in the Sacramento River, where the present bridge is, two and a half feet. An acquaintance of mine who lives there, tells me now that in low water it raises about six inches now at the bridge at Sacramento, across the Sacramento River. It was nearly three feet there in eighteen hundred and forty-nine.

Q.—Have you told the committee about the filling in of the Yuba on this side, at a place near here, the difference in the level now and in the past?

A.—I have never made a very close estimate of that, but my estimate has been that the Yuba River had filled in twenty-two feet; that is my estimate of it. The bed of the river opposite Marysville has raised twenty-two feet. I believe the cause of that is the hydraulic mines.

Mr. Parks—There have been two propositions made here. One is to appoint a commission to examine and devise a plan of relief, and report to some future Legislature; another is to empower the Board, when they find a remedy, to carry it out and apply it. Which of the two plans would you favor?

A.—Well, I should want to explain it. I will say this: I would favor a commission that would have power to examine into it, and apply the remedy, because we are living in constant dread. We have to protect ourselves by expensive levees, and we have to pay four and a-half per cent. levee tax. We live in constant dread of this mining debris coming down and ruining us all. I am in favor of the earliest practicable way out of the difficulty.

Mr. Berry—If, in putting this plan into execution—if the people who own the land have to pay for it, are you still in favor of carrying it out? Where would you have the taxes come from—from the mines, or the swamp lands, or the State at large?

A.—In justice, it should come from the side that does the damage.

Q.—If you were a member of the Legislature, how would you apportion the pay for the damages—what part to the State, what part to the mines and agricultural interests it might involve?

A.—I would put very little on the agricultural interests. If I was a legislator, reasoning in a reasonable way, when I come to see where there is a set of farmers, a whole community, who had lived there without any levees from eighteen hundred and forty-nine down to eighteen hundred and sixty, sixty-one, and sixty-two, and then they were compelled to build expensive levees, such as we have, to pay four and a half per cent. levee tax on all our property to keep up these levees, I would say that these men should not pay one cent, except what their portion might be as taxpayers of the State.

Mr. Parks—Would you be willing that the swamp lands, if by these means they could be reclaimed, should pay their share?

A.—Well, of course, if these swamp land owners wanted to pay anything towards it, they ought. I think if they pay taxes to the State, that would be sufficient. If the lands are worth only one dollar an acre now, and the value is increased by this reclamation to twenty dollars an acre, they should bear their proportion.

Q.—Would you assess any personal property, or put it entirely on the mines and swamp lands. Would you put any of the burden on the general property of the State?

A.—I can only answer, as I did before, that those who caused the damage, and those who are to receive benefits, should pay it.

Mr. Berry—Then you think the cause of having to do all this work is traceable to the mines?

A.—Certainly, sir.

Q.—Then your theory is that the mines should pay for it?

A.—Yes, sir. I don't believe that there is one-millionth part of this debris comes from the agricultural lands. It is a very small fraction.

Mr. Ostrom—I will ask you whether there are any two streams which you can compare, one of which has mining on it and the other none?

A.—We have little creeks—then right at home here, Coon Creek. Six or eight years ago there was some mining going on there, and the water came down muddy, and there was farming all along the creek, and since the mining ceased the water comes down perfectly clear.

Q.—That is next to saying that no appreciable element of this destruction comes from these farming lands?

A.—That is my opinion. It is equivalent to saying that the whole destruction comes from the mines.

Mr. Berry—You are familiar with the whole subject—what would be your remedy? What remedy would you apply to it?

A.—I can see no permanent remedy but to prevent the mud and debris from the mines from coming into the valleys in its soluble state until it resettled. I would require the miners to take care of it in the mountains. That is the only remedy I can see.

Q.—What is your opinion about some mode of retaining the heavy gravel at the base of the mountains? Could that be done, and the light material sluiced out and carried to the bay, by confining the waters by levees?

A.—I think not. The increase of the grade of the river at Rose Bar has been close on to one hundred feet. The bed has raised that much since eighteen hundred and forty-nine, while at Marysville it has raised but twenty-five feet. Consequently the river has a grade of eighty feet between here and Rose Bar—a distance of about sixteen miles. This heavy grade will carry down more material than ever, and is constantly increasing. If Mr. Parks' idea is carried out the reservoirs in the mountains would have to be such as to make the water almost clear, otherwise it would not work.

Mr. Kercheval—What is your opinion about building levees from Colusa down and confining the water of the Sacramento, and thus scouring out the river?

A.—I don't think the Sacramento River, from Colusa down, could be made to hold all the water in extreme floods. There might be a levee made strong enough; I don't know.

Q.—How high a levee do you think it would take?

A.—It would take a levee no less than twelve feet high.

Q.—How high are the levees in your district above the land on the inside?

A.—About eleven feet, I should say

Q.—Are you acquainted with District Number Six?

A.—Yes, sir.

Q.—How high is that levee?

A.—About eight and a half feet, I think.

Q.—How wide is it in your district, in the narrowest place, between the two levees?

A.—About five hundred to six hundred feet.

A. B. DIBBLE,

Recalled.

Mr. Ostrom—I stated in my testimony that I had come to the conclusion that the gold product of Yuba, Placer, and Nevada Counties was one-sixth of the one thousand millions of dollars taken out. It is my conclusion now, after thinking it over, that the mining area on the Feather, Yuba, and Bear Rivers has furnished four hundred millions of dollars.

J. MARCUSE,

Sworn and examined.

Mr. Coffey—I am at present farming in Sutter County. I have followed that occupation about seven years in connection with merchandising. I am acquainted with the subject matter of this investigation. I agree with the statements already made in regard to the damages. I agree with Mr. Dresher as to the proportion of this debris to be attributed to the mines. I don't think the agricultural wash from the hills would ever create any damage alone. I think it is mostly caused by the mines. It is a matter that should be remedied as soon as possible, both for the interests of the mines and the farmers. I think a commission should be appointed with full power to act. I believe that is the only practicable mode. A few men can act better than a great number. I would not favor a plan of having them report to the Legislature; that would only cause delay. The only question in my mind is about raising the money; it would require an immense amount of money. It is a matter of importance to the entire State, and I think the State at large should contribute towards it. I would not tax the agricultural interests separately, because they would be taxed to raise the general State tax. I would place a special tax on the mining interests, because it is the mines that causes the damage. I believe that levees are of no use whatever unless you can make additional outlets for the water.

Mr. Kercheval—Where would you construct these canals—at what point?

A.—That would be entirely a question of engineering skill.

Q.—What effect would this canal have on the Sacramento River?

A.—It would take an immense pressure from the levees which you construct.

Q.—There is an immense amount of this debris carried in the water. Now, you divert this water at Knight's Landing, where it is nearly clear; by diverting half of the water, say, would not that decrease the scouring force of the river so that the bed of the Sacramento River would fill up faster below?

A.—I believe in high water stages there would still be all the water that the Sacramento could carry, and the scouring force would not be diminished.

Q.—How would it be in low water, the time when it fills up the most?

A.—My idea of the canal is to carry off the surface water after it gets to a certain height, and when the water recedes to a certain stage turn it all in the river.

N. S. HANLIN, M. D.,

Sworn and examined.

Mr. Berry—What is your occupation?

A.—I am a physician.

Q.—Are you a chemist, also?

A.—Yes, sir, I have studied chemistry, also.

Q.—Now, doctor, give us your knowledge of the amount of matter carried in solution by the waters of these rivers which have been used for mining purposes.

A.—Yesterday, at eleven o'clock, when the Yuba was nine feet, I obtained from the center of the main channel of the Yuba, here at Marysville, a quantity of the water at the surface—I could not go to any depth to get it, of course. I find that it contains six hundred and forty grains of solid matter to the imperial gallon; that is, one part solid matter to one hundred and ten parts liquid. That is less than one per cent.; that is, from the surface of the river. That is the amount usual in common water. Now, according to scientific reports, the River Thames carries, at the London Bridge, twenty-four and eleven-tenths grains of solid matter to the imperial gallon. That was taken two hours after the flood-tide. At another point, in the center of the river, it carries twenty-two grains to the gallon.

Q.—Then I understand you to say that this water contains six hundred and forty grains, while the water of the Thames contains but twenty-four?

A.—Yes, sir.

Q.—Then this contains about fifteen times as much solid matter as that?

A.—Yes, sir, about that.

Mr. Smith—Have you ever read any of the methods by which scientists have determined the amount of solid matter in water?

A.—Yes, sir.

Q.—What are they?

A.—Evaporation is one method, specific gravity is another.

Q.—Isn't it generally known that the only actual method of determining the amount of solid matter held in water is by evaporation?

A.—Yes, sir; that is the only exact method.

Q.—Haven't you read that the method of determining by specific gravity is uncertain?

A.—That would depend on the matter in solution. I know that the Yuba River water is quite free from silts in solution when it is settled. I didn't have the time to test the matter exactly. I tested it simply by weight. I compared it with distilled water. I weighed it on very accurate scales.

Q.—You have known of the method adopted of determining the earthy matter in the Mississippi River?

A.—Yes, sir.

Q.—Where Professor Rouges made the examination?

A.—Yes, I have read of it.

Q.—What was his method?

A.—My recollection is that he adopted the method of evaporation.

Q.—Do you remember also, in his report, that he thought it was utterly unreliable?

A.—I am not positive now about that. I have not seen it lately. In making this examination I simply thought I was competent to take the amount coming down the Yuba River and compare it with the waters of other rivers. Of course, the matter of silts in solution would not figure much in a gallon.

Mr. Coffey—Have you ever made any other kind of tests?

A.—Yes, I have tested it by evaporation also.

Q.—How do you account for the difference between the two methods?

A.—There is no difference, only you can weigh it more accurately.

Q.—Is there any difference in regard to the proportion of solid matter in the two tests? Was it about the same in both cases?

A.—Yes, sir, about the same—very nearly. I have tested it both ways, but not in this instance; not with the waters of this river.

Q.—Under the same conditions?

A.—Yes, sir.

Mr. Berry—Would not the water vary very much at different stages? In summer time, when the water is low, would it not contain more solid matter?

A.—I never examined it at that time, but I think there is a greater proportion of solid matter when the water is low.

Q.—Then, take the water here at one stage of the Yuba and test it, and then take it at another stage, and the same amount of water might contain more solid matter?

A.—Yes, sir; it varies from hour to hour.

Mr. Smith—It is supposed that earthy matter has a specific gravity not far from two; so that if it is by weight less than one per cent. it would be about one-half of one per cent. in bulk?

A.—Yes, sir.

Mr. Berry—If the water could have been taken near the bottom, it would have contained a much larger proportion of solid matter?

A.—Most certainly. I took mine from the surface of the water.

Q.—There has been a question here in reference to the proposition of appointing a Board of Commissioners, with full powers to act, and to employ a corps of engineers to investigate as to the feasibility of some plan of action.

A.—I think I would favor the appointment of a corps of scientific men or civil engineers, without investing them with any powers until after they make their report.

Mr. Parks—I want to know whether you are in favor, as soon as the remedy is found, of applying it immediately, or whether you would postpone it?

A.—I would apply it at once, sir.

Mr. Kercheval—Are you in favor of furnishing the money to apply this remedy at once?

A.—I think there should be a division amongst all; all interests should join in doing the work.

Q.—Are you in favor of having this commission appointed, and giving them full power to apply the remedy, without any further action?

A.—No, sir; I think that is too much.

Mr. Parks—Do you mean to say that this commission should report to another Legislature, and then that Legislature should appoint another commission to apply the remedy?

A.—As I said before, I would have it applied at once. I think the matter is of sufficient importance to apply the remedy before another two years. It should be done as soon as possible.

T. W. REESE,

Sworn and examined.

I reside at Oroville, California. My profession is that of a civil engineer and surveyor. I have followed this calling in California for about twenty years, in different parts of the State—in the valleys and in the mountains—in Nevada County and in the State of Nevada, in connection with different railroads. I have followed it here about six years.

Mr. Ostrom—You had considerable to do with some of the levee work above here on the Yuba. Now, go ahead and make a statement to the committee in regard to the facts that you found—give us your opinion of the feasibility of this levee system holding the water, and how long they will hold it, adopting the levee principle throughout the State for the water-courses?

A.—I approve of the levee system in preference to any other for controlling the waters of the rivers, but I don't think the levee system, as at present conducted, is sufficient. In other words, the levee system now is a district system; one district, or one locality, leveeing against another. But the leveeing of the rivers I consider the best way to control the water.

Q.—You heard these gentlemen make statements in regard to the feasibility of adopting a general levee system—give us your opinion on that point?

A.—Well, sir, I should, if the matter was left to me entirely, to undertake the reclamation of the swamp lands from overflow—I should make a complete survey of the valleys, the Sacramento Valley and the San Joaquin Valley—and adopt some system of levees that would reclaim the whole together, and protect the valleys.

Q.—You would protect the lands now used and reclaim the swamp lands by one general system?

A.—Yes, sir. The first Board of Swamp Land Commissioners, of which Mr. Dresher was a member, adopted a system of reclaiming localities separately, and, as far as my recollection goes, I don't know of any one particular district that has been reclaimed in that manner.

Mr. Parks.—Do you believe that all the waters of this valley can be confined within their channels with a proper levee system, and carried to the bay?

A.—Yes, sir.

Q.—Now, do you think that all the heavy material, the sand and gravel coming down, can be penned up and retained in the mountains, and that, in addition to carrying the water, these rivers will scour out the channel and carry this light material on to the bay?

A.—I think it would have that tendency during high water. It would deposit a portion of it during low stages, and move it when the water is high, provided it is confined as suggested.

Mr. Kercheval.—What effect would it have upon the scouring forces of the rivers, provided a system was adopted of cutting the banks of the Sacramento River at some place which might be designated, and diverting a great portion of the water from the rivers into canals?

A.—I think it would be well to reflect sometime and study the matter thoroughly before it should be done; that is my impression. I think it is a dangerous thing to do.

Mr. Ostrom—Now, in regard to this scouring of the streams, how does it come that the Feather River, at Oroville, has filled up so much when it is not out of its banks. The Yuba River here, under the bridge, is another instance. Feather River, wherever you confine it, has it filled or not?

A.—Yes, sir; it is filled all the way.

Q.—Does not that disprove this theory in regard to the river scouring out?

A.—No, sir; I don't think it does. I think when the flood comes and brings down the sediment and mud with it, that it carries it along, and as the water subsides it deposits.

Q.—Now, right close to this place we find the Yuba River with a strong current, and we see that river filling continually, notwithstanding the waters are confined. Now, does not that disprove the theory of the bottoms of the streams scouring out? Here are instances right here. I want to know how these things can be accounted for.

A.—I don't think these cases illustrate it at all, because at Oroville it is filled with large rocks, while our sand passes on. There the river bed is filled up with large rocks.

Mr. Berry—Now, you say that if the coarser material was stopped in reservoirs at the base of the mountains, and nothing but this lighter material be allowed to come down here, and the rivers be confined with levees, you think the channels would keep clear?

A.—I said I believed the tendency would be to scour it out during high water, but in low water it would deposit the lighter particles again.

Q.—Then, having high water enough, it would work on down, and not fill up as it passes here?

A.—No, sir, if the water was confined with proper levees.

Q.—Now, do you believe in the feasibility of precipitating and retaining this coarser material by building reservoirs?

A. I do, certainly. I think the proper engineering skill could devise means by which this coarser material could be retained in the mountains, and the lighter material carried on to the bay. That is a matter for investigation entirely.

Mr. Coffey—You say this matter could be carried down to the bay. What would become of it after it got there?

A.—I stated that if the waters of the rivers were confined during flood-time, when the waters were high, the tendency would be to carry off this lighter material, but as the water subsided it would deposit again. How far it would carry it I do not know; it might carry it to the bay provided the waters were confined. I think the tendency would be to deposit it on the way.

Q.—It would not go out into the ocean?

A.—I think the tendency would be to deposit it around the shores of the bay. Possibly some of it might go out into the ocean. I remember in eighteen hundred and sixty-one I went down and a stream of muddy water was seen rapidly passing out the Heads. I think, however, it would have a tendency to shoal around the sides of the bay. I don't know sufficient about the tides there to know whether they have any scouring force or not. I think, perhaps, they would keep a channel open; that is my impression; I have no knowledge of it.

Mr. Ostrom—You say you saw this muddy water passing out of the Heads?

A.—Yes, sir; in eighteen hundred and sixty-one and eighteen hundred and sixty-two, during the great flood.

Q.—If that filled the channels when they had banks, which were the same as levees—the banks and the deep channel were the same as if they were leveed?

A.—I don't think the waters have ever been confined yet. The district levee system has been entirely local. There has been no regular system adopted.

Committee adjourned to meet in Sacramento.

SACRAMENTO, February —, 1878.

The Committee met at the State Capitol. Present—Messrs. Ostrom, Garver, Coffey, Waters, and Kercheval.

J. H. KEYES,

Sworn and examined.

I live on Bear River, Sutter County. I am a farmer by occupation. I have resided there ever since eighteen hundred and fifty-six. I am acquainted with that country as it now is, and as it was before this change took place. In eighteen hundred and fifty-six, when I first settled there, it was a clear, running stream, with well defined banks, and it remained so until about eighteen hundred and sixty or eighteen hundred and sixty-one, when it commenced to fill up, and since that it has entirely obliterated the channel, running over the bottom lands in every direction. The fill that has taken place at the mouth of the cañon, on Bear River, is about sixty feet above the level of the channel, and about the confluence of the Bear River with the Feather the fill over the bottom lands is about twelve feet, and the bed of the stream has raised in about the same proportion.

Mr. Waters—Have you examined the substance of which this is composed to say whether it comes from the farming lands or the mines?

A.—I have, sir, and I can say that it comes from the mines entirely, or nearly so. The substance that comes from the farming lands is but a small proportion, variously estimated—and perhaps I am making a lower estimate—but I don't think that the fill that has come to our country from the farming lands or natural wash, amounts to any percentage at all. Reducing it to a nicety, I don't think it amounts to a one-thousandth part of the fill that has come over that country. As to the character of this fill—there has been a great deal of talk about the productiveness of it. This substance is entirely destructive to all vegetation, except the willow and the cottonwood. There have been statements made as to the richness of it, and its great value for potato raising. The facts are, that the stream on which I live is a large potato raising section, and the potatoes grow, without exception, on the original soil that has been protected by levees. There is only now and then a piece that will grow potatoes, of the filled land, and then it only gives a very small yield.

Q.—Have you ever noticed this fill; does it change? For instance: Say a piece of ground is washed over with debris to the depth of a foot this year; would it not, in several years, from the action of the air, become decomposed so as to make it better than it would be fresh?

A.—Well, I will state my experience. About the first fill we received down there was a light material, and to a certain extent it was rich. Now the fill is a coarse sand and gravel, and has no productive qualities of its own. The character of the fill has changed from what it was when I first came there. The first that covered the lands was a fine, sedimentary deposit; they are now coarse gravel, and even rocks in some places. There has been a continual filling up from year to year, and day to day. I estimate that the total area of land injured—or, in other words, not now susceptible of cultivation, in the Counties of Yuba, Placer, and Sutter, by reason of this fill, at about fifty thousand acres, and that of the very best character of land we have in the whole country.

Mr. Garver—Is that on Bear River alone?

A.—No, sir; the whole of it—there are three counties; there is a portion of Placer County. That land was of the best quality there was in the country. It was capable of producing crops yielding from twenty-five to thirty-five bushels of grain to the acre?

Mr. Ostrom—About how much would you estimate that land to be worth—what would be its value at this time?

A.—I would estimate that land at this time, if it was in the same condition that it was before this debris came on it, basing my rate of valuation on the lands in other portions free from debris, to be from sixty dollars to seventy-five dollars an acre.

Q.—Don't you think that this land, or a large portion of it, if this sediment was stopped, would recover?

A.—I think there is a large portion of it, if it could be protected from the yearly overflow of sand, would, in the course of time, recover. Perhaps a small portion, where it is entirely sand, would never become valuable—at least, not in a long term of years.

Q.—There was one question asked in regard to the filling up of these streams. Do you think it would take a very long time, provided this debris is kept out of the streams, for them to scour out the channels to their original depth.

A.—My opinion is that if the waters could be purified that they would deepen the channel and run within the banks, within a very short period of time. Perhaps in two or three winters they would cut down the channels so that there would be no danger from overflow.

Q.—Hasn't there been overflows before there was any mining?

A.—Yes, sir; these bottoms always overflowed, but not to the extent they do now.

Q.—Did the overflows in early times, before there was any debris, injure any of this land?

A.—They didn't injure it at all; the lands could be ploughed in two weeks after a flood. The original marginal space there on the rivers has extended from three to five miles in width.

Mr. Garver—In eighteen hundred and fifty-two, wasn't there a long time then that they had to go out of Marysville entirely by boats?

A.—There was; but that was owing to the high water caused by the melting of the snows, and not by the rains. This lasted generally only a few days, and soon run off.

Q.—Wasn't it the same way in eighteen hundred and sixty-one and two again?

A.—Eighteen hundred and sixty-one and two was when this debris first began to come down and settle. There was considerable on the Yuba. It was distributed in the lower sags of the land and made them muddy.

Mr. Ostrom—What is the comparative difference between the winters spoken of and the present one?

A.—Well, this winter we have not had near the water we had in eighteen hundred and sixty-one and two, though where the lands have been unprotected by levees, they spread over a great deal more country than they did in those years.

Mr. Berry—You stated a while ago that there was about one hundred and fifty thousand acres destroyed, and you estimated the value of that land at sixty to seventy-five dollars an acre. Would it be worth that now if it was in the same condition as it was before this debris came on it? What is that land worth now?

A.—I don't think the market value of those lands now, averaging them all the way through, would be over fifteen dollars an acre. Perhaps there are choice spots that would bring more than that. Fifteen dollars an acre, on average, would perhaps be high. The amount of dead loss would be fifty dollars an acre, at least.

Q.—You include, in making up this average, spots that have been leveed?

A.—Yes, sir; I do.

Q.—You mean by that, direct damage?

A.—Yes, sir.

Q.—What is the difference in the general prosperity of that country, in the way of personal property and improvements, had it remained in the same condition that it was?

A.—Well, it is a unanimous calculation that the improvements and personal property nearly equal the value of the land—the improvements and personal property attached thereto. I have not made any figures as to the relative value of it, but that is about it.

Q.—What is your opinion in reference to the final filling up of the streams? You say that Bear River and those streams have filled up—is it your opinion from your observations that the character of the water and mud passing down there that the same results will follow on the Feather and Sacramento?

A.—Yes, sir. I cannot see any other result if it continues. If they continue to dump this debris into the streams it must in time obliterate the channels of the Sacramento and other streams.

Q.—The filling of the bays would also follow?

A.—Yes, sir. Water runs down hill, and has a greater carrying capacity as you increase the grade.

Q.—Have you any remedy in your mind for this evil?

A.—Yes, I have thought of it. The most available remedy is to stop putting mud into the rivers; stop the hydraulic miners from using these streams as dumping places.

Q.—Any other remedy that you think of?

A.—I have thought of a good many different plans, but all of them, when you come to file them down, present a good many obstacles. One plan I have thought of, is to build dams in the cañons at certain distances, and divert the debris into them, so that only the lighter particles would come down.

Q.—Did you ever mine any yourself?

A.—I mined in eighteen hundred and forty-nine and eighteen hundred and fifty.

Q.—Have you recently been in the mountains to observe the hydraulic mining?

A.—Yes, I have been there within the last two or three years.

Q.—Is it your opinion that hydraulic mining is on the increase?

A.—Yes sir, it certanly is; new claims are being opened up all the time.

Q.—Has it ever suggested itself to your mind that mining could be prosecuted in any other way than it is now; in other words, if hydraulic mining should be declared a nuisance and abated, could they obtain the gold in any other manner?

A.—My observation has been that in a good many of the hydraulic mines the pay dirt only on the bottom of the claims exists. There are some few of these claims that have the gold distributed through the banks. I think there is a great deal of ground in those counties that the gold could be taken out by the drifting process instead of by hydraulic mining. That is a matter of opinion.

Mr. Ostrom—When this committee was at Marysville, the question was asked there in regard to the feasibility of leveeing these rivers, and the probability of being able to keep the debris in the rivers, and washing it down with the waters, by keeping the waters and the debris confined within the levees. Give us your opinion on that subject?

A.—My opinion is that the levee system is not an impossibility; but with the present amount of debris in the streams, it is impracticable to build levees with sufficient strength to carry all the waters with the filling that has taken place.

Q.—You are acquainted with that section of country—for instance, the Bear River country; about how much money has been expended on Bear River alone in the way of building the levees, and with what success?

A.—The success has been varied. There is but one small portion of Bear River that is what might be termed a success. The expenses for levees on Bear River, I presume, from first to last, has been close on to one million of dollars.

Q.—About the filling of Feather River; how much has it filled, to your knowledge, from as high up as you are acquainted with it down to Vernon?

A.—I estimate, from my own knowledge of Feather River, that the channel must have filled somewhere from six to ten feet, from the mouth of the Yuba down. Above that, I am not conversant with it.

Mr. Garver—We have not had any floods for two or three years until this winter?

A.—No, sir; no floods to amount to much.

Q.—Has the river filled enough to show how much tailings were left there this year; what particular rise have you noticed this year?

A.—Yes, sir; I was taking a look at a place the other day where the fill has been about three and a half feet this winter, clear across the bottom for a mile and a half.

Q.—How much has it filled down by the railroad there?

A.—Right there the levees hold it in a gorge, and it don't fill much there. You go below the railroad there, and it has filled a scope of country from a mile to a mile and a half, from three to five feet deep, this winter.

Mr. Ostrom—State about how much it has filled there at the railroad, and how often that road has been raised, and how high it was built in the first place?

A.—I think the first road was something like eleven feet (my impression is that it was) across this low place. I think it has been raised three times by the railroad. I don't know the exact raise each time, but from two to four feet each time.

Mr. Garver—Don't the whole slickens of that country come right in there, into those two rivers?

A.—Yes, sir; most of it.

Q.—On both of them, just at the mouth of the cañons of each stream?

A.—On Bear River they extend down into the valley on Feather River. That is a distance of about fourteen miles by the river. On the Yuba about ten miles. Bear River extends farther. The valley widens coming this way.

Q.—So, really, the slickens of nearly all the mines in that country empty into these two streams?

A.—Yes, sir; nearly all the hydraulic mining empties into these two streams. In Nevada County all of it, and a good portion of Placer County. That is the way I understand it. They claim these are the principal hydraulic mines of the whole State.

WM. PIERCE,

Sworn and examined.

I reside in Sacramento, and boat on the rivers. I have run a boat on the Sacramento River, Feather River, and some on the San Joaquin. I run on all the streams, according to my business, but the Sacramento River is where I usually run. I have run very little on Feather. I haven't been up that river since eighteen hundred and fifty-one.

Mr. Waters—Are you familiar with the course and bed of the Sacramento, and if so, how far up from the bay?

A.—I have been familiar with it during all this time up to the present. I didn't go as far as the Rhodes' place in eighteen hundred and fifty-one; I run up to Colusa in eighteen hundred and fifty-one.

Q.—Is there any difference, and if so what difference, in the bed of the stream now and what it was when you first became acquainted with it?

A.—I don't think there is any difference in the bed of the stream of the Sacramento after you get above Knight's Landing, with the exception of the change in the banks. I don't think the stream has filled up any, say any farther up than Colusa, and I don't see much filling up anywhere this side, that far up.

Q.—State what causes have been to work upon the river, from that point down, chiefly, and also what causes have been at work above?

A.—Well, the mouth of the Feather River has filled up—and the way I judge of that is that it don't get so low in its banks. Now, at Colusa, it will go as low in its banks as it did in eighteen hundred and fifty-one; but when you get to Knight's Landing it don't, and I attribute that to the Feather River backing it up and filling it there. I don't think there is any filling up of the Sacramento River at that point; but the Feather River has filled up, and that backs the water up for twenty-five or thirty miles. From this point down it has filled up a good deal. I suppose that from the mouth of the Feather a filling up of the Sacramento has taken place. In early times the river was, in places, very deep. These deep places have all filled up, and now it is of a uniform depth. I think it has filled up fully four feet here.

Q.—In eighteen hundred and fifty-one, how high up the river would the tide flow?

A.—So as to be perceptible as far up as Fremont. You can't perceive it that far up now.

Q.—About what point on the river that you can perceive the tide?

A.—Well, six miles above here you can see that there is a difference, perhaps two or three inches, perhaps four inches at the highest tide. About six miles, or above that, you can't perceive that the tide makes any difference—about the same as it did at Fremont twenty years ago. I don't think you can discover any tide to amount to anything more than six or eight miles above this place.

Q.—In early days, about how high would the tide bring the river up here at Sacramento?

A.—About two feet, I think, and at very high tide as much as two and a half feet here at this place. At present it is not more than fifteen inches at the highest—eighteen inches, perhaps. I could not be positive, but that is my opinion. It won't go very far, one way or the other.

Q.—Is there much farming done on the Sacramento River, above the mouth of the Feather?

A.—Yes, sir; it is a farming country all the way up the river.

Q.—Is there a farming country on the Sacramento River, above where you say the river comes down to the original low water-mark?

A.—At Colusa I don't see but what the water goes down as low as it did in eighteen hundred and fifty-one; in the banks, I think, may be a trifle lower than it was in eighteen hundred and fifty-one.

Q.—This part of the Sacramento River that has not filled up—has that part of the river any greater fall than the part which is filled up?

A.—Yes, sir. I don't think there is much difference in the fall at

Colusa, though there is a difference between Knight's Landing and Colusa. The higher up you go the more the fall increases.

Q.—Have you noticed any particular difference in the capacity from this point where the filling up has been seen—any difference in its capacity to carry off the waters?

A.—No, sir, I don't. There are some places, perhaps, that the river is wider, but the majority of it, from Knight's Landing to Colusa, the banks have not changed at all.

Q.—How is it below?

A.—The banks, from Knight's Landing to Fremont, I don't think have changed at all. You might say, from the mouth of the Feather River to Colusa, there is no perceptible difference, except a few places.

Q.—Well, from there down to the bay, has it increased or decreased?

A.—It has decreased, because it has filled up a great deal; that is, the bars have been filled up in many places; after you get below the Feather River, filled up a great deal farther than they were, so at low stages of water they are eight or ten feet, and there are places where the bars have been filled up two hundred and three hundred feet farther than they were in early times, by reason of the sediment. From Sacramento down to the bay, the same way, though not so much as it is above Sacramento.

Q.—Have you ever noticed the overflow in early days?

A.—Yes, sir.

Q.—As near as you can approximate the rain fall, do floods get to be any worse, or better?

A.—They are getting worse. I think the same amount of water flowing down the Sacramento River in eighteen hundred and sixty-two would not have made as much water this side of the Feather River as it does now. I don't think it would have made near as much. Above there I don't know as it makes any difference. Since this very highest water I have only been up as high as the mouth of Feather River during the present flood.

Q.—Has there been any change in the quantity of fish in the rivers of late years?

A.—Yes, sir; there is not near so many as there used to be.

Q.—What is the cause of it?

A.—Well, my opinion is, one cause of it was the muddy water, and another cause is they are fished so much that very few get a chance to get up the river. In early days a great many salmon used to run up to Right's place, and now there is very rarely any salmon caught up there. A great many attribute it entirely to the muddy water. The Sacramento River, even when it is not filled up, is not so clear as it used to be. That is because it washes its banks more than it used to do before steamboats run on the river, and before they cleared off the banks. That is one cause of the banks washing. The steamboats running had something to do with it. The greatest cause of the decrease of the fish is there are so many large fisheries, so much fishing, that they are mostly caught before they get up there. That is the main cause.

Q.—About what is the average height to which the water has been elevated by reason of the streams filling up with debris. How many feet above the old low water-mark is it at present?

A.—Well, at Knight's Landing, I suppose about a foot and a half or two feet, perhaps about a foot and a half, and from there to Feather River it increases. At the mouth of Feather River the water, at low water, is six feet above what it was in eighteen hundred and fifty-one.

Q.—Now pass on down, say to Sacramento?

A.—Well, at Sacramento I should say not less than four feet, and farther down it diminishes again. At the mouth of the Feather it is greater on account of the sediment. Here in town I don't know exactly what it would be. Down at Steamboat Slough I think the water goes as low as ever. I don't think it affects it there. From there to the mouth of Feather River it has filled a great deal.

Q.—Do you notice any bars forming down in the bay?

A.—Yes, sir; they have formed a good deal; the middle ground in Suisun Bay has built up. At low tide it shows; I don't know but this is one hundred acres of filled ground, what we call the middle ground, and twenty years ago you would not have seen five acres. It has increased considerable.

Q.—Have you examined those deposits?

A.—No, sir; I know by sounding the rate of the fill. It is composed of a light substance, what you would call sediment or light sand. In some places it is entirely sand, and in other places it is a substance lighter than sand. I never examined it more than to put a pole down into it. It is of a sort of yellow clay color. In many places around the bay I find black dirt. There is no sediment in that. That is always there—the black dirt.

Q.—Did you find this yellow sediment anywhere except where the rivers have washed in.

A.—No, sir, I don't think there is any except where it comes from the rivers.

Mr. Garver—I understood you that the river had a greater grade from Colusa up.

A.—Yes, sir.

Q.—And that the river would change its channel?

A.—Yes, sir.

Q.—It is sandy bottom in some places?

A.—No; for twenty-five miles above Colusa it has some sand and some gravel; higher up it is all gravel. There are changes, but the bottoms are sand and gravel.

Q.—When it changes its channel and cuts a new channel out it naturally has to throw that sand down to the next bar below?

A.—Yes, it has a tendency to do that.

Mr. Kercheval—You say you have run both on the Sacramento and on the San Joaquin?

A.—Yes, sir; very little on the latter stream.

Q.—Now, in your examinations, about what proportion of this filling comes from the mines and what proportion from the farming lands?

A.—Well, on the Sacramento River I should say ninety-nine one-hundredths of it comes from the mines. That from the farming lands is a very small proportion.

Q.—You stated that the Sacramento River has not filled above the mouth of the Feather?

A.—No, sir; not for twenty-five or thirty miles.

Q.—Now if this debris, or any considerable portion of it, was from farming lands, the upper Sacramento River would be filled up just as much?

A.—Yes, sir; just as much. The banks of the Sacramento River wash as much as they do on Feather River.

Q.—Would not the same state of facts exist on the San Joaquin?

A.—Yes, sir; I suppose so. I don't know whether that has filled any or not.

Captain Foster—Do you remember about what the depth of water was along the city front when you first commenced running here?

A.—I think in eighteen hundred and fifty-one we had about, in low water, from twenty-five to thirty feet of water along the city front.

Q.—That was about the depth of water extending across to the other shore?

A.—Yes, sir. I think the deepest water was about the middle, or perhaps along the Sacramento side.

CAPTAIN ALBERT FOSTER,

Sworn and examined.

My occupation is that of a steamboat captain. I have been acquainted with these rivers since eighteen hundred and fifty-one. I have run on all the streams, but more particularly on the Upper Sacramento, and on the river between here and San Francisco.

Mr. Waters—Describe the changes you have noticed since that time?

A.—Well, starting from the Upper Sacramento, I can notice no filling in there since the time I commenced running. I had soundings, but I haven't them. I have soundings taken on the river all the way from the mouth of Mill Creek, clear down to September, eighteen hundred and fifty-one. I have found shoal places below Right's place, at that time, which I have never seen since. The banks up there are of such a nature that in high water they kept cutting, and the river kept changing all the time. Still, the current is such that the bed would not fill. I would not change much from Captain Pierce's statement, until you get down to Knight's Landing. From Knight's Landing down to Fremont, the Feather River backs up the water so that now we run over places where in eighteen hundred and fifty-one was dry bars. There are bars there now, but there is water enough, from the backing up of the Feather, to enable us to run right over them. The filling in of the river from Fremont, down all the way to the Feather River, is much more I think than many of them think. I have some facts in reference to this river, immediately in front of this town. In my judgment, in eighteen hundred and forty-nine, the river would average about twenty-four feet, from shore to shore, in front of the city here at Sacramento. I sounded the river to-day, so as to give facts. The lowest water of eighteen hundred and sixty-nine was two feet nine inches above that of eighteen hundred and forty-nine. In speaking of eighteen hundred and forty-nine, I refer to the gauge that has been kept here—the 'forty-nine gauge. That was here before there was any perceptible change in the rivers. The lowest water in eighteen hundred and sixty-nine was two feet nine inches above that of eighteen hundred and forty-nine; the lowest in eighteen hundred and seventy-four, was four feet nine inches above that of eighteen hundred and forty-nine; the lowest water in eighteen hundred and seventy-five, October, was four feet five inches above the 'forty-nine gauge; the lowest in eighteen hundred and seventy-six, October, was seven feet one inch above the 'forty-nine gauge; the lowest water in eighteen hundred and seventy-seven, in September and October, this last fall, was five feet three inches above that of eighteen hundred and forty-nine.

Q.—Now, as to the seasons; how did the seasons prior to this time compare—were they drier or wetter?

A.—I think never but once since I have been here was there less water in the river than there was this past season—eighteen hundred and seventy-seven. At that time the difference was five feet three inches. There was an average depth to the river along the city front here, in eighteen hundred and forty-nine, of twenty-four feet, at low water. This depth extended nearly clear across the river. The average depth in front of Sacramento, in eighteen hundred and seventy-eight, in low water, would not exceed eight feet; and as the water was five feet three inches above that of eighteen hundred and forty-nine, it would show a filling of debris equal to twenty-one feet three inches—solid filling in. I have made soundings to-day, starting on the Sacramento side and going on a line below the piers across to the Yolo side, about two hundred feet below the bridge; we sounded between the piers. We found by these soundings forty-five feet of water on the Sacramento side, next forty-two, next thirty-six, next thirty-six, and last thirty. Again, opposite I Street, we started with forty-five feet, next sounding, going across, thirty-eight feet, next thirty-three feet, and the last thirty-three. Opposite K Street, the first sounding was thirty-six feet, next thirty-six feet, next thirty feet, and last twenty-four feet. These were made, all of them, in a straight line across the river. Opposite M Street, the soundings were thirty feet, twenty-seven feet, thirty feet, and twenty-one feet. Opposite P Street, twenty-seven feet, twenty-seven feet, twenty-seven feet, twenty-one feet. Opposite the gas-works, on Y Street, thirty feet, twenty-seven feet, twenty-one feet, and eighteen feet. This gives an average of thirty feet five inches on all the soundings. The water on the gauge was twenty-two feet one inch—on the gauge at the time, at K Street. The soundings were both above and below that gauge. The average depths, compared with eighteen hundred and forty-nine, would be eight feet four inches. Deducting twenty-two feet one inch shows that the debris at this time is fifteen feet eight inches more than it was in eighteen hundred and forty-nine. The scouring away during this flood, according to these figures, would be five feet seven inches. That is from bank to bank. The washing out has been five feet seven inches during this last flood. That will overrun, take it all along the river. It has scoured out more than that, take all along the river. This shows that the flood has scoured the channel out on the Sacramento side here about down to the original channel of eighteen hundred and forty-nine, but it has not done so on the Yolo side.

Q.—From your knowledge of the river, have other deep places filled in in about the same proportion?

A.—Yes, sir; about the same.

Q.—In early days, about what proportion of the river beds was occupied by bars and deep places?

A.—There were very few bars—what we call bars—in early days. There were shoals—the Hog's Back, and several bars down that way.

I suppose we would carry an average depth of three or four fathoms of water in early days—all except these particular shoals I speak of. The average now, I should say, would not be half that much. These bars and shoal places are much shallower now than they were then.

Mr. Garver—How much has it raised at Hickox Shoals?

A.—Well, we have, as against eleven feet, less than six feet this last season. The debris has raised, I think, more in proportion, because the water don't go as low in its banks. But where we would have six feet at low tide this year we used to have eleven feet.

Mr. Kercheval—Speaking of Hickox Shoals, you say now the relative condition is as six to eleven.

A.—In the channel.

Q.—So in early times you went almost anywhere?

A.—Yes, sir; we generally made about one crossing. Where there is a dry bar this summer we generally had eight or nine feet in early days.

Q.—What do you think of the relative carrying capacity of the river, take it from Sacramento down to the bay, compared to eighteen hundred and forty-nine and eighteen hundred and fifty?

A.—Well, it is, in times of flood, perhaps one-quarter less, maybe not that much difference. The water now, from the first rise, goes off quickly, more so than the same amount of water in eighteen hundred and forty-nine, because there is more fall.

Q.—Do you notice any difference in the tides?

A.—Yes, sir. The tides in eighteen hundred and forty-nine, I have seen schooners swung up stream right here in town. Then the tide used to go from twenty to thirty inches. The tide at Fremont used to be from ten to twelve inches. At Knight's Landing it was perceptible—some three or four inches—so it would show on the bars. The tides this last season—I don't think our highest tides exceed eight or ten inches here at Sacramento. Only a very full tide is seen at all here. Full tides swell the river a little.

Mr. Garver—How is the water on the Hog's Back bar?

A.—There is about the same difference in the depth of the water. There has been a wing dam there. But at low water it is not over six feet on an average. I have not been there to sound it for two or three years. It used to carry eleven feet, in high tide, in early days.

Q.—Isn't it more than six feet now at high tide?

A.—Yes, sir. But five feet at low water.

Q.—What is the average tide there in low water?

A.—I know they used to figure on it, and came up there with vessels drawing eleven feet of water; it must have been more. I don't know the average tide there in summer.

Q.—Didn't a schooner sink there in early days, and obstruct the channel?

A.—No, I think not.

Mr. Ostrom—What is your opinion about the debris filling the bay?

A.—It is noticed at two points, in places where there is slack water. In the main channel I think there is but little difference in the depth. At Seal Island, I think, there is less water there now than in eighteen hundred and forty-nine. The channel is about the same.

Q.—You think the filling that takes place is around the edges of the bay.

A.—Yes sir, in slack water.

Q.—What is your opinion in regard to this relief canal so-called?

A.—Well, it is no new opinion. I have always advocated the building of a canal here on the west side of the Sacramento, so as to carry the natural overflow of the Sacramento River from above Colusa. They could do that, I think.

Q.—About the width such a canal would require?

A.—With these large floods there would not be much danger of their getting it too big. I would not build it less than six hundred or one thousand feet wide.

Mr. Kercheval—Now, there has been some talk of cutting a canal up at, I think, Gray's Bend, cut into the river, digging it from three hundred to one thousand feet wide, cutting the bank down six feet, and put weirs in so the water would pass over. Now I want to ask you, what effect the diversion of that amount of clear water would have in decreasing the scouring forces, thereby enabling the Sacramento to keep itself clean of the sediment coming from the mines.

A.—I believe every particle of water that you take out of the river that you can force to go through decreases the scouring capacity just that much.

Q.—Will not diverting this clear water have that effect?

A.—In high water the water is quite muddy that comes down the Sacramento. In low water it is clear.

Q.—Now, my proposition is to take it out below the mouth of Feather River, so as not to take the clear water.

A.—Well, in taking the overflow above Colusa, flowing towards the Feather River, also from the Feather River, it fills a very large basin of water there. My idea is to reclaim that to cut a canal through there. In doing so, if they carry that water in a canal, they have to strike the Sacramento River above Fremont. In doing that it would necessitate the cutting of a bank and making the canal from the opposite side.

Q.—Would it not be better to take the water out below the mouth of the Feather River, in order to divert the clear water entirely?

A.—I am satisfied that the water below Fremont is muddier than above, so that a canal running out below Fremont would carry more sediment than one taken out above; in high water, however, not to any great extent.

Mr. Waters—Did you ever figure on the probable cost of a canal that would carry such a flood as we have had?

A.—No; I have guessed two or three times. I think it would go up into the millions. I think one of the hardest things to attain is in making the banks of the canal stand. I think the same trouble would be found in trying to keep the water in the Sacramento with levees. I consider it is impracticable to levee against the water of the Upper Sacramento River, because I have seen the banks cut away in one rise, in one place, one hundred yards to the depth of twenty-five or thirty feet; and the more you confine these waters, the more they will drive into the bends. It will go half a mile to a levee, and cut through it. If even you could build the levees high enough, they would undermine and cave in. You would never know when you had the levee far enough away. As you get down this way there is less current, and the levees are less liable to cut. I believe it has been shown that the river will carry from twenty-four to twenty-five feet, and I think it is policy to make the river carry all you can. If you could take the water by this canal straight across and empty it into Suisun Bay, where it would not back up the water of the Sacramento, that water would get down there and spend its force before the rise in the Sacramento would get near to the bay. It would have a shorter cut and a great deal more fall than the Sacramento.

Q.—Did you ever make any calculation on this basis? I understand the fact to be that the upper end of the streams are all of a higher grade than down here?

A.—Yes, sir.

Q.—Now, how big a canal is it going to take to carry the water up there, so as to keep it from overflowing? We find just so many gallons per hour passing here. How deep a canal is it going to take?

A.—Well, if your canal is ready to work, as soon as the water comes over the banks, it is ready to travel off in the canal. It will not work as it does now. Now it fills up in the tule lands above Knight's Landing. It gets that full so that it is two or three feet higher than in the river. Then it breaks through, and comes down to the next district, and so on down. I noticed the other day down at the islands—at the foot of the island it must have been two feet higher than the river itself. It breaks over and runs down inside of the levees, and thus breaks through one place and another. If they had had no levees at all the water would not have gone near as high at Grand Island, in my judgment. I think there was not as much water as there was in eighteen hundred and sixty-two.

Mr. Kercheval—Now, as a relief, not full but partial, what do you think about cutting a canal through the Montezuma Hills, and meeting the tide water over at Denverton?

A.—I think if a canal was made there it would relieve you down about the islands in such time as this, in fact all the overflowed lands down there. We have a foot or eighteen inches more water in the Sacramento to-day than we would if it was not for the rush of water going out of Cache Creek Slough. It forms a regular dam. It backs the water up as far as here. The current is not as strong in the river now as it was two weeks ago. This checks the current and prevents us getting rid of the waters—commences the stuffing process. Take Old River, and it is slack water there now. There is no current at all this side of the Montezuma Hills. The sediment, with this current here now, travels on down to the slack water, and there it will fill in.

Q.—There is a terrible current down at Cache Creek now?

A.—Yes, sir. A barge came up and had to make three trials to get up. In eighteen hundred and sixty-two, in the measurements I made in the big flood, we had thirty-four feet at the Wright place. It spreads out and drops very rapidly. Just in the cañon above there they had forty-five feet. Take it near Princeton, and the average depth would not vary much from twenty-four feet. When you get here it decreases, and at the head of the islands they had twenty-four feet on an average—fourteen feet six inches above low water. As you go on down, it is not more than two or three feet above the highest tide; so when you get below there you don't notice it. In the Straits of Carquinez we only noticed a rise there of some five or six feet above high tide.

Q.—What effect does this sediment have—or did you notice any material change in the American River?

A.—We used to have quite a little river here in early times; now there is none.

Q.—What effect does the filling of the American River have on the City of Sacramento here?

A.—The more it fills up the easier it will overflow, making it necessary to build higher levees. It would not make very much difference, as long as the levees are away above, whether it fills up or not.

Mr. Ostrom—You are acquainted with the Feather River—can you make any statement in regard to the Feather, the navigation, and the condition then and now?

A.—I have not navigated the Feather river but little of late years. I have been up but once or twice, within the last five years, in low water. I will say that the Feather River is not as low—does not go as low in its banks, take the average from Fremont to the mouth of the Yuba. I don't think it goes as low in its banks by eight feet as it did then. We have no shoal water now; there is not more than two-thirds the water in it now that there was then, because the whole river bed has filled up. The shoal places are no shoaler now than they were in eighteen hundred and forty-nine, but it confines itself to a canal now, whereas it used to be quite a river.

Q.—It used to be that the steamer Governor Dana run on this river in summer time?

A.—Yes, they used to run the boats in summer. This is the Governor Dana No. 3; this new boat is about one hundred and sixty feet long, and the old boat was only about one hundred and fifteen feet.

Q.—What is the difference in the draught of water?

A.—I think the old boat used to carry not less than twenty inches of water, perhaps nearly two feet. She never went up in low water. The second Governor Dana used to go up in low water; it was about a fifteen-inch boat. The present Dana draws heavier. She draws about twenty-two inches, called a two-foot boat.

Q.—About how much would you average the filling of Feather River?

A.—There used to be a good many deep holes there. The average filling of the shoal water is, say, six feet right at the mouth of the river. But if you take the deep holes, and there used to be a good many of them, the average from the mouth to Marysville would be at least twelve feet. The carrying capacity is filled up or decreased about six feet.

Q.—Does that include the whole filling along the banks?

A.—There are a great many bars now where there used to be none. The carrying capacity between the natural banks, without reference to any cubic measurements, would be at least one-third less than it used to be right at the mouth of the river.

Q.—Would the same rule hold good as far as Marysville?

A.—I think it will hold good as far as Marysville.

Q.—About how deep were the banks of the river in former times?

A.—In places it would go over twenty feet. There are other places where there is not over eighteen feet. There are places where these banks vary with the width of the river. Some of these people built their levees without a surveyor, and the floods go right over them, because the river varies more in high water than it does in low water; it will change. Even surveyors find they have to make calculations for the bends. I presume the height of the banks at the mouth of the Yuba and the mouth of the Feather would have been about twenty feet.

Q.—You stated that you thought there was not more than two-thirds of the water coming down the Feather River. How do you account for that?

A.—It is used up in mining and for different purposes; mining mostly.

Q.—It has been suggested by one or two witnesses the loss was to be attributed to the water seeping through the sand.

Q.—There is no doubt but that has something to do with it. This light sand all carries more or less water.

Mr. Garver—Has the river scoured down this winter to its original channel?

A.—Take the average from shore to shore, it has scoured down five feet seven inches. It has scoured out that much since the low water of last summer.

Mr Ostrom—Is it not your experience that these rivers scour out in time of high water, and then fill up again in low water more than they were filled before?

A.—I think the fill is not so great now as it was several years ago, on account of the increased grade.

H. M. LARUE,

Sworn and examined.

I reside in the City of Sacramento. I located here first in June, eighteen hundred and fifty, on the American River. My knowledge of these rivers extends back to eighteen hundred and forty-nine. I am acquainted with all the rivers, but more particularly with the American River. I have lived there for twenty years. I moved into the city lately. When I first settled on the American River, out on the continuation of Fourteenth Street, the river was very deep, and had very high banks and a broad channel, and the water extended from bank to bank, and there were no sand bars on the river from the mouth until you got up ten or fifteen miles; in fact, there was none on the river that I knew of at all. I used to have a little boat that I run down to the city. There were very high banks where the mouth of the river is now, where now there is a sand bar ten or fifteen feet out of water in low water stages. Two miles above there was a shoal, but with that exception there was no sand bar at all. There was deep water until you got to the old Gwin's place, where there was quite a rapids or fall. That is covered up ten or fifteen feet with sand to-day. The whole river, from here to there, is filled up ten feet or more. I was there in eighteen hundred and fifty—in August, September, and October—and we had about twenty inches of tide. Sometimes at high tide the ferry boat would drift up stream. I don't think there has been any tide since eighteen hundred and sixty-two. I never observed any. Up at my farm there, where we used to have high banks, and the water never bothered us—though, in times of very high water, it run over my bottom lands probably four inches deep—I raised all kinds of crops, and never had any trouble, except for a few days at a time. Since eighteen hundred and sixty-two the water stands over it half the time during spring and winter, and over the whole of it during a good portion of the time. In fact, I have had to sell it for less than one-quarter of what I had been offered for it before the water came on it. The melting snows in the spring never used to affect us. We had a fine orchard on the property. Now the melting of the snow covers half the land.

Q.—Give us your opinion of the cause?

A.—It is from the debris brought down from the mountains. The sand and sediment fills up the river.

Q.—What proportion of the washing land—hillside land—up in that water-shed, is cultivated to crops and ploughed up?

A.—I could not tell you, exactly.

Q.—How would it compare with the tailings from the mines. It has been claimed before this committee that this filling in is to be attributed as well to the wash from agricultural lands as to the mines. Give us as close an approximation as you can?

A.—The greatest fill we have had in the American River was deposited in eighteen hundred and sixty-two and in eighteen hundred and sixty-eight. Previous to eighteen hundred and sixty-two the amount of farming done in the mountains was very limited. What has been done since that, I do not know. I know the nature of our agricultural lands is not to wash out into the river. After the flood of eighteen hundred and fifty-two we had but little high water in the American River until eighteen hundred and sixty-two; but once or twice that the river was out of its banks. In very great high water, in sixty-two, we had a continuation of freshets that brought down this great deposit of sediment. I have seen different deposits; some one place and some another. One place it would be coarse sand, and not a hundred yards from there it would be fine sediment. The current has a good deal to do with that.

Q.—I suppose you have noticed the mines, and have seen their dumps? Have you noticed whether the coarser material lodges above?

A.—Yes; the farther down the river you go, the finer the deposit.

Q.—Now, has any of these coarse tailings, or rocks, got into the river?

A.—Well, not to any great extent, in this section. Up at the falls, or rapids, we used to have a ford, and the bottom was of coarse cobbles; but since that has been covered up I have not seen any in the river. Just where the railroad bridge crosses the river now the bed of the stream used to be covered with coarse rocks, but now there is nothing but sediment and sand.

Q.—Since the flood of eighteen hundred and sixty-two, have you been up the American River up to a point where you again come to bowlders?

A.—I don't remember now how far up. Wherever there is very much fall you will come to rocks and bowlders.

Mr. Ostrom—About how much farming land—what was formerly known as bottom land—has been destroyed on the American River bottoms?

A.—Well, not a great deal entirely destroyed. It has been injured. I think the place I had was injured the worst, because it was so situated. There was an island near me covered with willows that caught this debris, and when the bed of the river rose it was inclined to make a lake. Sloughs that would be dry in early days would since swim a horse. This coarse sand on land is valueless. I don't think the land is worth as much by fifty to seventy-five per cent. as it was before that sand deposit came there.

Q.—About how much would that land be worth now if it was in its former condition?

A.—I was offered, in eighteen hundred and fifty-eight, for the poorest part of my land, one hundred and twenty-five dollars per acre; and I was offered one hundred and twenty dollars an acre for fifty acres that I sold three years ago for twenty-five dollars an acre, after I had planted an orchard and put fences on it.

Q.—About what amount of personal property, improvements, etc., that would necessarily attach to the land in addition to the loss of the land?

A.—The loss of personal property has been very great. Much of the land was not improved to any great extent; it was kept for raising grain. But all the land that was planted to orchard was ruined. I had a fine orchard that was entirely destroyed. It destroyed, out of six thousand trees—I lost five thousand that were entirely destroyed. That orchard produced, in eighteen hundred and sixty-four, fourteen thousand dollars worth of fruit. I generally sold about ten thousand dollars worth a year. I have since sold the property, with all the improvements, for six thousand dollars; and I have never seen the time since that that I could have got that much for it.

Mr. Garver—Are orchards as valuable now as they were then?

A.—Yes, sir. I raised as much the year before it was destroyed as I did five years before that. Peach orchards are getting very scarce now.

Mr. Ostrom—Have you ever formed any opinion as to any mode of relief.

A.—Yes, sir; a very decided one. I think these canals are the only hope of reclaiming these counties. From all the light I can get on the subject I think it is practicable. I have never had any faith in levees. I have seen the effects of leveeing.

Q.—You having lived here for a long time, I would like to ask you if this city, and its surroundings were free from the damage and destruction from this debris what effect would it have on the appreciation of property?

A.—Well, that is a hard question. Good land around here—this land below the city, has been rating from one hundred and fifty dollars to three hundred dollars an acre. All this land north of the city, that is now covered with willows and brush, ten or fifteen years ago was all cultivated to vegetables. It is worth nothing now; you can judge from that what the land would have been worth. I certainly think that the mines ought to be controlled. My idea is, that if any commission is to be appointed they should have power to act. You must not wait too long to apply the remedy; if you do you will swamp us. I would have a commission appointed by this Legislature. I would go to the extent of having them carry out the remedy; and I have the same opinion in regard to the canal. I would think, without having given the matter much thought, that the money should be raised by general taxation. The whole State is benefited by it. I don't see any other way at present. We must quit the county if it is not stopped.

L. F. MOULTON,

Sworn and examined.

I am a farmer, and reside in Colusa County, nine miles above Colusa, on the east bank of the Sacramento River. I am more particularly acquainted with the Sacramento River. I have been acquainted with the Yuba and Feather also. In eighteen hundred and fifty-three-four I was acquainted with the Yuba at Marysville. Then it was a clear stream, and the banks, I should say, were twenty-five feet, at least, above the water. Now they are filled up very much from the mining debris. Some say it is from the ploughed land, but I don't think one-millionth part comes from the ploughed land. In Butte Creek, where I am interested, there is a canal that comes from the Cherokee Mine, some four hundred feet wide, and sends its deposits down on our land. It is filling up the lands very fast, and must injure and eventually destroy it. The sediment is no benefit—it is a positive injury, and the substance that comes down with the water in time of floods is pipe clay, and entirely poisons the land. I don't think this would ever decompose so as to make good soil of it. There is sometimes a certain class of stuff brought down that will, in time, decompose; but it is not pipe clay. I think that this poisons the land. It gets so hard that you can handle it in big chunks like a rock. It is like alkali in its effects. This winter the company's canal has broken in several places, and it has run out and destroyed a great deal of property. There are some places there—section thirty-five—that it has filled up from sixty to one hundred feet wide. The upper portion is filled up entirely. From there down it has filled the creek up entirely, and destroyed the channel entirely. And then it will commence and run through it again, with a fresh addition of water.

Mr. Waters—Has this filling up of the creek caused any overflow?

A.—It has that tendency. It has only been running down there about a year; it used to fill up above; it has filled up the country above to a great extent, until now it is getting down to us.

Q.—Have they left these tailings there in such a way that heavy rains will not wash them away into the rivers and into the valley?

A.—They have made no provision, except to make their canal point straight at us. We get the whole force of their tailings. I think it is their intention finally to discharge it into the Sacramento River.

Q.—What is the fact?

A.—The fact is, that it does run into the Sacramento River, through this culvert, put in there by District Number Five. I have seen it running through there.

Mr. Ostrom—Is this land valuable that these tailings are covering up?

A.—It sells at from twenty dollars to fifty dollars an acre.

Q.—You say it has only been running about a year?

A.—Yes, down that far. It has been running above that several years.

Q.—Has it done a good deal of damage?

A.—Yes, sir.

Q.—State your opinion as to the remedy.

A.—That is a sticker. I have thought the matter over—and I am something of a civil engineer, too. The only remedy I can see is to build dams to hold back the tailings. They did propose to do that at one time. The river will only carry off the light stuff; the heavy material will stay there. I have advocated this plan of canals for a great many years; but as the thing advances I am rather timid about it. I am rather inclined to think the best remedy is to stop the tailings up there in the mountains. I don't think they have any right to throw their tailings down on the farming lands. I think the mining interest is increasing and the farming interest is increasing, and it seems to me the miners should be compelled to take care of them. I don't know; they may have rights, but I can't see it.

GEORGE W. HANCOCK,

Sworn and examined.

I am a farmer and stock raiser. I have been a stock raiser more particularly than a farmer. I am acquainted with the Bear, American, Sacramento, Yuba Rivers, and with the adjacent lands on both sides of the rivers, above Sacramento and Butte Slough, and below Sacramento on the west side, and above Butte Slough on the west side of the rivers. On the channel of the American River there was a few years ago a little cut made across a point, which was one hundred or so feet wide, which now carries all the water at low water. I have been acquainted with the Feather River, and have noticed it at Nicolaus, and where formerly it had a natural break of twenty-five feet, this year it only has fifteen, with a levee nine feet eight inches above the bank. I lived on the Sacramento River when I first came to the country, just above the city; was there in the flood of eighteen hundred and sixty-two. They used to have a gravel bar, and since the flood of eighteen hundred and sixty-two, there has never been anything of it. There are three things, one of which we have got to do. One is to take care of the mud, the other to take care of the water, and the other is to get up and leave the country. I have made some estimates, and I find the cost of cutting through this ridge of Montezuma Hills—there has been a survey there and it is nine miles, and the highest point is twenty-six to twenty-nine feet—to have it one thousand feet wide will cost, at ten cents per yard, which is a very low estimate—I believe that it cannot be done for a million of dollars—the figures are nine hundred and thirty-eight thousand six hundred and sixty-six dollars. I believe that it would be giving a commission too much power, to give them power to carry out any plan they might devise, unless it should be a good one, and I don't believe that any cheap plan can be made. There is a way to get rid of this mud, and that is to run it into these low tule lands and fill them up. This patch of land north of the city—fifty thousand acres—Bear River and part of the Yuba River could be turned into that. Canals would have to be built to run it in there. It will only answer for a time—I could not tell how long a time, but for Bear River it will last for a number of years. In some places—one place in particular—Bear River has filled up sixty or seventy feet, and covered up one of the finest bodies of land I have ever seen. It varies from that depth to about twelve feet at the mouth. None of the ground covered by this debris ever produces anything but willows before it is again covered by something of the same nature. This pipe clay is very poisonous to land. In the neighborhood of Newcastle, they have to settle the water that comes from the mining ditches before they can use it for irrigating. It would ruin their land entirely unless they settled it. I notice this, that whenever the land has been overflowed and this pipe clay settles, that there will be no grass the next year, and sometimes not for two or three years.

= Doc. 54a